The Archaeology of Variation: a case study of repetition, difference and becoming in the Mesolithic of West Central Scotland

Allan Dene Wright

MA, MLitt

Submitted in fulfilment of the requirements for the Degree of PhD in Archaeology

University of Glasgow

Archaeology: College of Arts

April 2012

Abstract

This thesis comprises a regional synthesis of the diversity of the human experience in West Central Scotland during the Mesolithic period (c.7875-c.4200BCE). The research area incorporates the modern local authorities of Ayrshire, Dunbartonshire, Glasgow City, Inverclyde, Lanarkshire and Renfrewshire. The regional profile has been constructed from a comparison of the lithic assemblages from mainland coastal and inland sites in a transect (c.2550km^2) from Ballantrae and Girvan on the Ayrshire coast inland to Loch Doon, South Ayrshire and beyond to the Daer Valley in South Lanarkshire. Three other sites from South Lanarkshire outwith the transect have also been included in the study, namely Climpy, Powbrone and Weston. Reference has also been made to sites on the islands of the Firth of Clyde and at Loch Lomondside. The archaeological and environmental evidence from the Ayrshire coast has been considered, supporting the interpretation of probable sedentism at Girvan during the Late Mesolithic.

The theoretical structure can be distilled into two main themes, namely variation and technology which are folded into a cohesive framework by reference to the philosophies of Gilles Deleuze, and in particular his 1968 work *Difference and Repetition*. The concepts of repetition, difference and becoming have given meaning to variation as something more profound than a mere contradiction. In this thesis, these concepts have been recast to incorporate the *chaîne opératoire*. Firstly, variation in people and things are forged in the social dimension through repetition. Secondly, technology is understood as inseparable from the agent, where the people and things are both subject and object, and things may be understood as detached parts of people. It is by conjoining these enhanced constructs of variation and technology that people and things as technology inscribe the landscape to create a meaningful taskscape; referring to the notion proposed by Ingold in 1993. These concepts as becoming have been used to explore notions of identity, group identity, social boundaries and taskscape as inseparable qualities of Mesolithic lifeways.

Detailed technological analysis of the surface collections and excavated assemblages comprised within this study has confirmed the continuity of lithic practice across the greater part of the Mesolithic period. Subtle nuances have been recorded in technological choices made, and also in the composition of the lithic assemblages. The main variation lies in the choice of raw materials. The distinctions are more profound than the dominant use of flint at the coast and chert inland. Marked variations in both the colour and original cortical surface of raw materials are identified suggesting differentiated resources across the landscape and different groups of hunter-gatherers. The presence of flint at the inland sites is interpreted as representative of pioneer incursions. The variations in the assemblages of West Central Scotland, together with the cautious use of ethnographic analogy allow consideration of the cosmological significance of raw materials and the materiality of stone. The notion that the use of specific raw materials is culturally proscribed has been instrumental in the interpretation of hunter-gatherers groups who are either predominantly practising sedentism at the coastal lagoonal habitats of Girvan, or creating new group identities and adopting more mobile lifeways inland.

Table of Contents

List of Tables

List of Figures

List of accompanying material

The digital appendices are available on request. Please contact 'theses@gla.ac.uk'.

Appendix II: Site database;
Appendix III: Bibliography for site database;
Appendix IV: Lithic database for Ballantrae and Girvan;
Appendix V: Lithic database for Climpy;
Appendix VI: Legend for database V;
Appendix VII: Lithic database for Daer 84;
Appendix VIII: Lithic database for Daer 85;
Appendix IX: Lithic database for Daer Reservoir;
Appendix X: Lithic database for Loch Doon;
Appendix XI: Lithic database for Powbrone;
Appendix XII: Lithic database for Weston;
Appendix XIII: Legends for databases IV and VII to XII, inclusive.

Acknowledgements

This research was funded by The Carnegie Trust for the Universities of Scotland, for which I am truly grateful and proud to be a Carnegie Scholar.

I must thank Dr Sally-Anne Coupar of the Hunterian Museum and Joanne Turner of Dumfries Museum for granting access to surface collections for analysis. Special thanks must go to Alan Saville of the National Museums Scotland who arranged for access to the archive at Leith, the transfer of lithic assemblages from Leith to the NMS, and he also allowed me access to the unpublished assemblages from Daer Reservoir. The generosity of Tam Ward and the Biggar Archaeology Group has to be acknowledged. Tam kindly agreed to loan the assemblages from Daer 84, Daer 85 and Weston to the University of Glasgow to facilitate my research.

My thanks must go to Alice Watterson for the lithic illustrations, and to the research post-graduate community at the University of Glasgow for the banter, humour, abuse and cakes. They have never failed to make me smile, and my unerring gratitude goes to Dr Adrian Moldanado, Dr Elizabeth Pierce, Dr Anthony Russell, Marjon Steedman, Carmen Cuenca-Garcia, Kevin Grant, Terence Christian, Amanda Charland, Ryan McNutt, Jen Novotny, Rebecca Younger, Alison Kyle, Courtney Buchanan and others past and present. Special mention must go to Dr Louisa Campbell for more than eight years of friendship and support.

The staff in Archaeology at the University of Glasgow has given me enormous encouragement throughout the years of my undergraduate degree, MLitt and PhD research, although I have to single out my mentor and supervisor Dr Nyree Finlay, who has simply been and continues to be inspirational.

Finally, to my wonderful wife Liz who supported and encouraged my early retirement to study archaeology, and has had the good grace to appear interested in everything I have since done. The support of our daughters and their husbands, namely Melanie and Paul, Rachel and John, Amy and Euan and our beautiful grandchildren, Dylan, Lewis, Ethan, Chloe and Jacob has been immeasurable, just by being there and reminding me of what is truly important. I have to apologise to Ethan and Chloe for the absence of dinosaurs, wolves and pirates.

Author's declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature: ________________________________

Printed name: Allan Dene Wright

Chapter 1: Introducing the archaeology of variation

1.1 Introduction

This chapter sets out the research aims, context and methods used. Consideration is given to the integrity of West Central Scotland as a geographic unit for the purpose of the thesis, and concludes with a chapter structure.

Throughout the thesis all dates are calibrated and expressed as BCE, wherever possible. Where texts express a radiocarbon date BP, this is in most cases calibrated by reference to either a table of approximate correspondence (Hedges 2008), or formally calibrated using OxCal 4.1 (Bronk Ramsay 2011).

1.2 Research aims, context and methods

In recent years, the Mesolithic period has emerged as a vibrant and dynamic research focus in Scotland with a number of detailed regional studies, for example the *Southern Hebrides Mesolithic Project* 'SHMP' (Mithen 2000) and the *Scotland's First Settlers Project* 'SFS' (Hardy and Wickham-Jones 2007). However, current approaches have veered away from more synthetic treatments of regional diversity and have tended to view the Mesolithic occupation of Scotland as homogenous. The intention is for this research to seek to redress this imbalance and explore intra-regional, inter-site and intra-site variation.

My research is comprised of a regional study of the Mesolithic material culture of West Central Scotland, an area that has been largely neglected since the 1980s and includes a comparison between coastal and inland sites. In particular, several issues have been examined. Firstly, the definition of social territories and settlement patterns in the region are addressed. Secondly, aspects of lithic technology and practice, namely raw material difference and technological choices have been explored. Thirdly, the wider environmental context has been considered, together with an examination of the evidence to support the notion of sedentary occupation in key zones.

The research has established a regional profile using technology, chronology, environment and settlement patterns exploring the relationship between inland and coastal occupation. The work undertaken has encompassed a re-appraisal of sites and lithic assemblages from unpublished excavated lithic scatter sites and surface collections, the detailed technological examination of lithic assemblages, and a synthesis of the material on the post-glacial environments and settlement of the region.

The structure of the thesis incorporates theoretical constructs drawn from philosophy, analytical philosophy, psychology, anthropology and archaeology (cf. Section 1.4).

1.3 Research area

The research area comprises of a number of modern local authority boundaries (Figure 1.1) which can have no relevance to the Mesolithic period. Hughes (1991) encountered a similar problem in determining whether a specific area had any veracity as a geographic unit. She resolved the problem by referring to natural features in the landscape creating watersheds and, thereby, defining the integrity of the research area (also Spikins 1999). Bartholomew's (1895) *Atlas of Scotland* (Figure 1.2) was consulted and it was noted with some surprise that the modern local authority boundaries to the eastern and southern limits of West Central Scotland follow the watersheds. To be consistent in using the watersheds to define the research area the northern limit has been extended to incorporate Loch Lomondside. The islands of the Firth of Clyde are also incorporated within the research area.

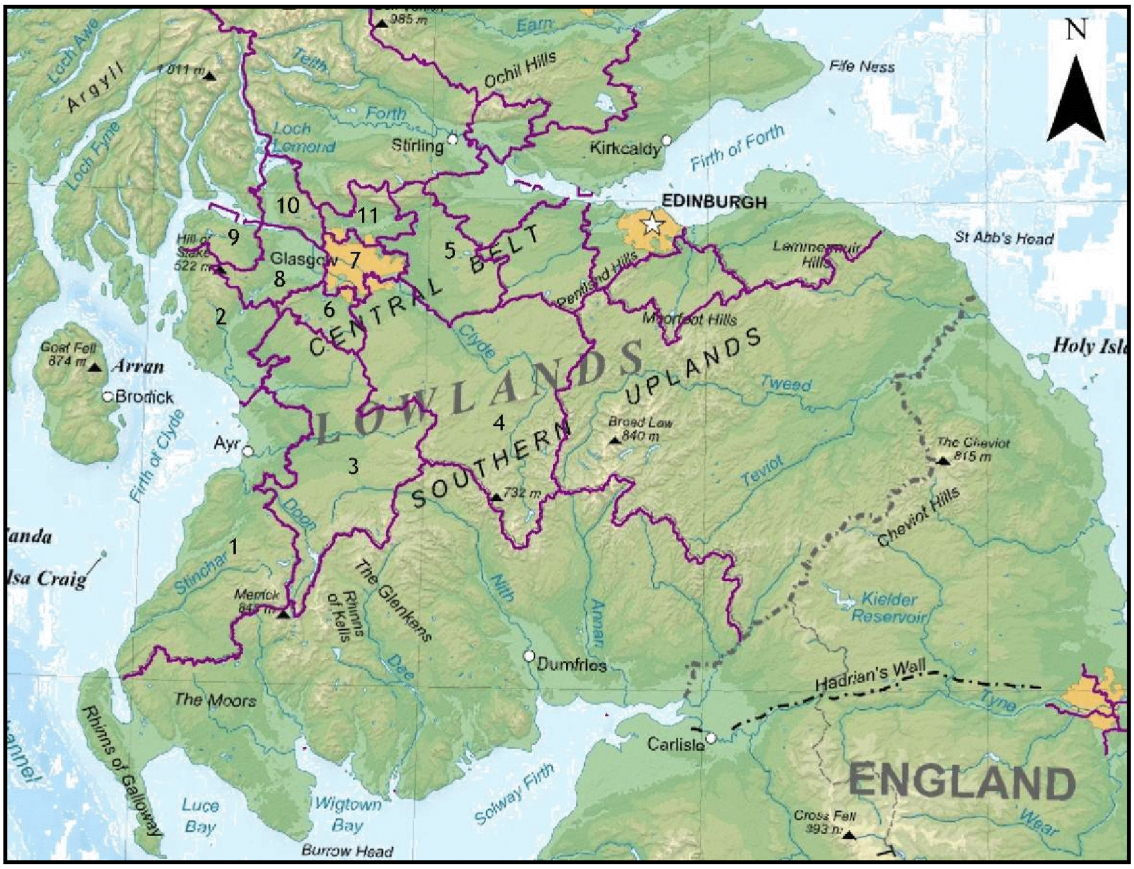

Figure 1.1: Research area which incorporates the local authorities of East Dunbartonshire (11), West Dunbartonshire and Loch Lomondside (10), North (5) and South Lanarkshire (4), Glasgow City (7), East Renfrewshire (6), Renfrewshire (8), Inverclyde (9), North Ayrshire and the islands of the Firth of Clyde (2), South (1) and East Ayrshire (3). Base map © Eric Gaba – Wikimedia Commons User: Sting.

Figure 1.2: Map of watersheds from the Atlas of Scotland (after Bartholomew 1895). © Bartholomew Collins used with permission.

1.4 Chapter structure

Chapter 2 comprises of a thematic literary review of the Mesolithic period proving the validity and integrity of the research aims and objectives posed. The themes comprise of sections dealing with current perspectives and debates relating to the chronology of the Mesolithic period, aspects of regionality including a case study from the culture history milieu. The history of research in West Central Scotland is presented concluding with a brief outline of the environmental perspectives within the research area.

The theoretical structure to the thesis is introduced in chapter 3. The *bricolage* encompasses abstract notions drawn from a number of diverse academic disciplines. The chapter is sub-divided into two main substantive sections, namely technology and variation. Firstly, a historiography of technology and how its meaning has changed is presented, incorporating aspects relating to understandings of the landscape, settlement and subsistence, identity and group identities. Current archaeological and anthropological approaches are recast incorporating the ideas taken the philosophical writings of Gilles Deleuze (2004 [1968]; 1986). Secondly, Deleuzian variation is considered in terms of his theoretical concepts of repetition, difference and becoming (Deleuze 2004 [1968]). Difference or variation arises out of repetition, and becoming is the dynamic of difference (*ibid*; Stagoll 2010). It is appropriate for a thesis largely focused on the analysis of lithic assemblages that the binding agent for these two themes is the *chaîne opératoire*. A case study on gender seeks to explain the interaction of repetition, difference and becoming.

Chapter 4 presents the research methodological framework for the typological and technological analysis of the lithic assemblages. This framework is in the main from the SHMP (Finlayson *et al.* 2000), augmented by reference to other analytical conceptual schemes (Finlay 2009; Madsen 1992). The notion and efficacy of the research transect are considered, and the assemblages/surface collections analysed are introduced along with three outlying sites as control assemblages. Other sections deal with bias in assemblages, sampling strategies the nature of palimpsests, and the pertinent drift and solid geologies to potentially highlight the local availability of raw materials.

The data from the typological and technological analyses of the assemblages separated into primary and secondary technologies is presented in chapters 5 to 7 and Appendix 1. The site database and lithic databases together with accompanying legends are included as digital appendices.

Chapter 8 commences with a section on the known chronology of the research area, which is widened to include data from elsewhere in Scotland. What follows is a discussion of the principal issues arising from work undertaken for my thesis. This includes reference to the common differences (after Wilk 2004) and variations at intra-regional, inter-site and intra-site scales of enquiry. The concepts of the conjoined abstract understandings of technology and repetition, difference and becoming pervade throughout interpretations flowing from these discussions. The interpretive strategy is further enhanced by reference to ethnographic analogy and offers interpretations on a wide range of themes comprised within Mesolithic lifeways.

An ethnographic analogy is considered against the evidence for sedentism at the Ayrshire coast during the Late Mesolithic period, which is used to explore the nature of coastal occupations. Social boundaries and the nature of inland occupations of West Central Scotland are discussed with reference to a Mesolithic site in Wales. Chapter 8 concludes with the regional profile of West Central Scotland.

Chapter 9 summarises the salient points from each of the chapters, places the regional profile of West Central Scotland into wider Mesolithic debates, and considers the future potential and difficulties for undertaking regional syntheses.

Chapter 2: Searching for variation

2.1 Introduction

This chapter comprises of a thematic review of aspects of the history of research into the archaeology and environment of West Central Scotland during the Mesolithic period.

The chronology of the period is considered from Lacaille (1954) to current perspectives, including the possibility of Late Palaeolithic events, the ongoing debate into the existence or otherwise of an Early/Late Mesolithic divide in Scotland, and the problems associated with defining the end of the Mesolithic period and the transition to the Neolithic.

A case study from the culture history milieu is presented to show how regional profiles are constructed and reconstructed creating variation manifest as coastal, inland and intra-regional identities. The efficacy of the normative concept of the seasonal round is considered to determine whether or not it impedes the recognition of scales of variation.

The diversity of raw materials is highlighted for further discussion in Section 4.7. Their potential for markers of identity and group identities at intra-site, inter-site and intra-regional scales is explored. The difficulty in defining meaningful regions for the Mesolithic period is investigated; discussing the impact of research strategies in the recognition of regional variation and constructing regional profiles.

Consideration is given to the academic assessment on the state of research, and the nature of the resource focusing on the importance of the amateur archaeologist and local societies, and the contribution from academic research projects and rescue archaeology. The principal sites in the research area are outlined on an intra-regional basis, namely the islands of the Firth of Clyde, the coastal occupations of Ayrshire and the inland occupations of Ayrshire, Inverclyde, Lanarkshire, Renfrewshire, Dunbartonshire and Loch Lomond.

The environmental perspectives comprise of a brief overview of the marine transgressions and regression of the Holocene sea on the Ayrshire coast and the academic reconstruction of the Late Mesolithic habitats at Ballantrae and Girvan. The nature of the emergence and disturbance of woodlands are also considered.

2.2 Chronology of the Mesolithic period in Scotland

The beginning of the Holocene determined the start of the Mesolithic period, which according to Lacaille (1954, 308) was thought to be 6800BCE, now generally considered to be c.9530BCE (Finlayson and Edwards 2003 [1997], 109). Lacaille's tentative chronology of the Mesolithic in Scotland suggested that the initial settlement by hunter-gatherers in the south-west and west and central was coeval with the onset of the Atlantic climatic phase at c.5000BCE, with the Neolithic commencing with the Boreal at c.2500BCE (Table 2-1). Epi-mesolithic events were considered to continue in the coastal zones of the south-west, and the west and central Scotland into the Iron Age (Figure 2.1; Lacaille 1954, Table VI).

Chronology of Climatic Phases	Lacaille 1954	Present understanding
Beginning of Holocene	6800BCE	9530BCE
Boreal	6800-5000BCE	9530-6625BCE
Atlantic	5000-2500BCE	6625-3780BCE

Table 2-1: Comparison of Lacaille's (1954, 308) chronolgy of climatic phases to present understanding (Ballantyne and Dawson 2003, 27; Ballantyne 2004, 30; Tipping 2004, 30; Whittington and Edwards 2003, 13).

The basis for the chronology was fixed within the cultural history milieu with the identification of type-fossils from the migrations of cultural groups as they moved north from England and north-east from Ireland, and demarcated five distinctive regional zones in Scotland [Section 2.3] (Figure 2.1; Lacaille 1946; Lacaille 1954, Table VI).

The earliest radiocarbon date for the occupation of Scotland is currently from Cramond, Firth of Forth at 8630-8290BCE [9250±60BP OxA-10180] (Lawson 2001, 124; Ashmore 2004, 99). A similar date of 8550-7950BCE (9075±80BP AA-30354) comes from the inland site of Daer Reservoir 1, South Lanarkshire (Ward 1998; Ashmore 2004, 100), although it is now recognised that there may be issues with its reliability (A. Saville pers. comm.). Ashmore and Wickham-Jones (2007) point out that settlement for the first half of 9th millennium BCE is recorded at Howick, North Northumberland (Waddington 2007a) and East Barns, East Lothian (Gooder 2003; 2007), to which The Carrick, Loch Lomondside (MacGregor forthcoming) and Creit Dhu, Isle of Mull (Wicks and Mithen 2011, 9) may be added.

Where Lacaille (1954, Table VI) envisaged a gap of nearly two millennia from the start of the Mesolithic period until the first known events; radiocarbon dates have reduced this perceived hiatus to approximately 1000 years (Section 2.2.1.1). Accepting the reservations of the efficacy of the date from Daer Reservoir 1, Finlay (forthcoming) makes the intriguing point that the first known occupations on the coast and inland were broadly contemporary.

Lacaille's (1954, 146-147) Epi-mesolithic occupations may be said to indicate the problems associated with culture history made manifest in attempting to define the end of the Mesolithic period. Although the position is arguably no clearer today more than 20 years after Woodman (1989) bemoaned the absence of a sustainable chronology of the Mesolithic period in Scotland (Section 2.2.1). Overlaps in radiocarbon dates for the Mesolithic and Neolithic periods are known (Ashmore 2004). The Mesolithic 'Obanian' events continued until 3660-3360BCE [4765±65BP OxA-3739] at Carding Mill Bay 1, Oban (Bonsall and Smith 1992). The Sands of Forvie site from which a non-'Obanian' assemblage with microliths was recovered has provided even later dates at 3520-3090BCE [4595±55BP GU-11298] (Warren 2007). Even though there are possible issues regarding the efficacy of the Sands of Forvie dates the Mesolithic period extends up to 700/800 years after the generalised date for the start of the Neolithic in Scotland at c.4000BCE (e.g. Warren 2005, 9; Thomas 2008a, 58).

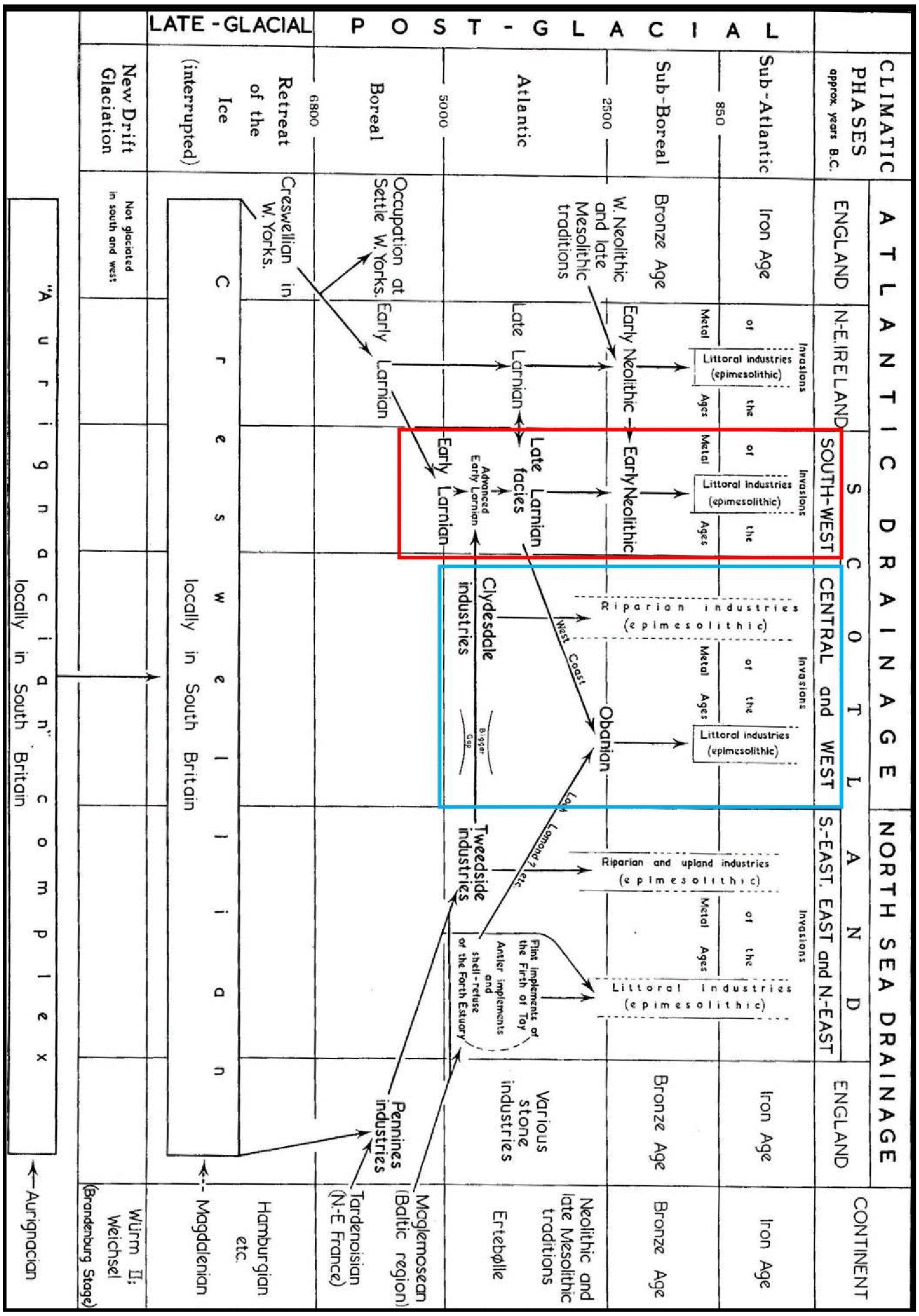

Figure 2.1: Lacaille's (1954, Table VI) tentative chronology of the Stone Ages of Scotland. South-west and Central and West Scotland highlighted. © Oxford University Press used with permission.

2.2.1 Current perspectives on chronology

2.2.1.1 Late Upper Palaeolithic events in Scotland

The possibility of Late Upper Palaeolithic events in Scotland, typologically attributed to the *Hamburgian* (Ballin *et al.* 2010) and *Federmesser* (Saville and

Ballin 2009) periods, may suggest the absence of evidence for Mesolithic hunter-gatherer events in Scotland for approximately 1000 years after the onset of the warmer Holocene is due to the bias of discovery rather than an actual hiatus. It should be noted that there is a similar temporal hiatus for Mesolithic events in Ireland (Woodman 2009, xxxviii).

Two tanged points from Shieldaig (Clarke 1987; Walker 1973) and Tiree (Livens 1956) have been attributed to the *Ahrensburgian* tradition [10200-9800BCE] (Saville and Ballin 2003). An initial report of a flint and chert mixed period assemblage from Howburn, South Lanarkshire was thought to include both narrow blade and broad blade microliths indicating a possible Early Mesolithic phase (Saville *et al*. 2007). Further work undertaken on the assemblage and material from subsequent excavations revealed the presence of tanged points and a zinken-like tool form which have been ascribed to the *Hamburgian* (13000-12000BCE) cultural tradition of the Late Upper Palaeolithic (Ballin *et al*. 2010). Ballin (2008, 4) makes the point that most quartz assemblages were considered to be of Bronze Age provenance. A re-assessment of the quartz assemblage from Kilmelfort Cave, Argyll suggests that the artefacts can be typologically dated to the *Federmesser* (11800-10700BCE), post-dating the *Hamburgian* in chronology of the Final Upper Palaeolithic (Coles 1983; Saville and Ballin 2009).

A tanged point from Bridgend, Islay has been interpreted as reminiscent to forms found in early Holocene assemblages in Northern Scandinavia. The artefact has also been considered to tentatively support palynological data indicating human impacts on vegetation prior to 9000BP [c.8200BCE] (Edwards and Mithen 1995; Wickham-Jones and Woodman 1998; Finlayson 1999). The form of the Islay artefact has been distinguished from the Shieldaig and Tiree examples, and has been interpreted as a microlith or small knife (Ballin and Saville 2003, 123).

Research currently ongoing on the tanged points of Scotland, including artefacts recently found in the Northern Isles, is also suggesting a closer typological affinity to Scandinavian traditions (N. Woodward pers. comm.).

2.2.1.2 The Early Mesolithic/Late Mesolithic debate

Chapter 5 in Kozlowski's (2009) *Thinking Mesolithic* synthesises the scholarly work undertaken from the 1970s, (e.g. Kozlowski 1977; Rozoy 1978; Brinch Petersen 1973; Gramsch 1987) to demonstrate the time transgressive changes in the form of microliths and their related technologies evident in north-west Europe. The synthesis is organised on a regional basis to facilitate comparison. Research continues in Europe unabated into the form of microliths as temporal indicators (Bailey 2008, 361; cf. Blankholm 2008; Dolukhanov 2008; Zvelebil 2008). Woodman (1989, 2-3) resolved that these changes were not discernible in the corpus of English material.

Jacobi (1978) determined that broad blade or non-geometric assemblages were contemporaneous with Star Carr, although Woodman (1989, 3) suggested that there was no sustainable justification proffered for this position. Reynier (2000, 2005, 18-22) sub-divides the Early Mesolithic of England into two distinct stages based on typological variations and the composition of microlithic assemblages; the Star Carr and Deepcar type phase 9000-8400BCE, is followed by the Horsham type phase 8400-7750BCE. The narrow blade or geometric microlithic component appeared, replacing the broad blade microliths, in north-east England from c.7690BCE. The narrow blade assemblages were dominated by scalene triangles and backed blades (Mellars 1976). This sudden change was the basis for the English model to define the Early and Late Mesolithic periods. Other tool forms found in association with broad blade microliths comprised of bifacially flaked core/flake axes, burins, long oblique truncations, end scrapers and microdenticulates (Barton and Roberts 2004, 342; Reynier 2005). The use of the truncation scheme devised by the *SHMP* (Finlayson *et al*. 2000, 69) is crucial in seeking to determine the chronological provenance of oblique truncations (cf. Section 4.2).

The assemblages from the upland sites in the north of England were not representative of the diversity of the human experience, but only spoke to a narrow range of activities (Woodman 1989). Jacobi (1987) recognised regional diversities in the form of microliths, without ascertaining a chronological sequence (Woodman 1989, 3). Diversity is also seen in assemblages in Scotland. For example, the crescent dominated microlithic assemblage from Fife Ness

(Wickham-Jones and Dalland 1998); scalene triangles are the most common microlith form in the assemblage from Auchareoch (Affleck *et al.* 1988), and backed bladelets at CTSF, Arran (Donnelly and Finlay nd.).

The Mesolithic assemblages from Scotland, except for those true 'Obanian' sites, contain predominantly narrow blade microliths (Woodman 1989, 7). There was a reluctance to utilise the Early/Late Mesolithic model from southern Britain based on the broad blade/narrow blade microlithic assemblages proposed by Jacobi (1973; 1976; 1978) and Mellars (1974) at c.7690BCE, because there were no equivalent assemblages in Scotland (Morrison 1982a; Woodman 1989). Broad and narrow blade microliths were noted from Morton (Coles 1971; 1983a; cf. Bonsall 1988; Clarke and Wickham-Jones 1988), Barsalloch (Cormack 1970), Lealt Bay, Jura (Mercer 1968) and in the surface collections from Shewalton (Lacaille 1930). This English model was implicitly incorporated into the Scottish literature. In Morrison's (1980) *Early Man in Britain and Ireland*, the chapter on the Early Mesolithic does not mention Scotland.

Woodman (1989) provides a detailed and comprehensive analysis of the evidence, the radiocarbon dates, and the related interpretations for Early/Late Mesolithic events in Scotland and determined that there were three possible scenarios. Firstly, if the isosceles and scalene triangle dominated assemblages from Glenbatrick 1, Lussa Bay and Morton Site A are typologically compatible then they represent an early phase of the Mesolithic period in Scotland largely based on the English model. Lussa Bay would probably have been occupied prior to the commencement of the marine transgression. Saville (2004b, 205) offers the crescent microlith dominated assemblage from Fife Ness (Wickham-Jones and Dalland 1998) to argue against Woodman's notion (1989, 3) that such assemblages represented a succeeding phase to assemblages where the predominant form of microlith is the scalene triangle, concluding that this demonstrates the homogenous nature of the Late Mesolithic period. This notion of a continuation of technological practice throughout the greater part of the Mesolithic period is a major recurrent theme of my thesis in both theoretical and analytical terms (Chapters 3-8, inclusive).

Secondly, the assemblage from Morton Site A equates to a Late Mesolithic occupation(s) based on the radiocarbon dates, although it is now regarded as comprising of wholly Early Mesolithic pieces recovered from discrete locations (Saville 2004b, 206). Research into the Early/Late Mesolithic divide continues to be driven by an overarching hypothesis which appears to encourage a top down approach. Thirdly, regional diversity may account for the common differences in the assemblages at different times (Woodman 1989).

The assemblages since Woodman's paper which are deemed to include broad blade microlithic elements are Weston, Lanarkshire (Barrowman forthcoming), Chest of Dee, Aberdeenshire (Ballin 2004), Nethermills, Aberdeenshire (Saville and Wickham-Jones 2010), An Corran, Skye (Hardy *et al.* forthcoming) and Raasay (Ballin *et al.* 2010). Saville (2008, 211) has tentatively offered a date of c.8400BCE as the demarcation, once again based on the English model coeval with end of the Horsham type period, between the Early and Late Mesolithic in Scotland. This is based on a number of early dates for narrow blade assemblages, i.e. Cramond (Lawson 2001) and East Barns, East Lothian (Gooder 2007). Based on the evidence from Cramond, Saville (2008, 213) cautiously suggests the intriguing possibility that narrow blade assemblages may have originated in Scotland.

An understanding of the presence of broad blade microliths in Scotland remains vague (Finlay *et al.* 2003, 107). The higher percentage frequencies of supposedly broad blade forms recovered from the Lussa Bay (Mercer 1970) and Glenbatrick 1 (Mercer 1974) sites on Jura leads Mithen (2000a, 16) to suggest that an early phase of the Mesolithic may be possible in the Southern Hebrides. My own view is that until such time as broad blade microliths are recovered in association with those other tool forms present in the English Early Mesolithic assemblages, then the Scottish material cannot and should not be forced to fit the English model.

2.2.1.3 Mesolithic-Neolithic transition

The possibility of a non-microlith Mesolithic espoused by Finlay *et al.* (2003) has not been taken up by academics generally, although refer to SFS (Hardy and Wickham-Jones 2007a). Saville (2004b) accepts that the complexity of transitional phase is not understood (contra Schulting and Richards 2002; Richards 2004) which may mask variation in the choice of raw material and regionality. This particular issue may have particular resonance with studies relating to the Mesolithic/Neolithic transition, and as pointed out by Mithen (1999) an area of research requiring attention, and echoed by Cummings (2007; 2009). It has been suggested that the onset of drier climatic conditions at c.3800-3700BCE heralded the transition to agrarianism by local populations (Bonsall *et al.* 2002).

The overlapping of radiocarbon dates (cf. Ashmore 2004) does not assist in determining a fine chronology to the Mesolithic-Neolithic transition (cf. Section 8.2). Warren (2006a) undertook an analysis of Early Neolithic assemblages from Eastern Scotland. The distinctions in the *chaîne opératoire* between the Mesolithic and Early Neolithic are marked. The main features as variations in technological practice for the Early Neolithic are set out at Table 8-2. The increase in the utilisation of quartz and bipolar reduction is also a feature at the Late Mesolithic 'Obanian' shell middens on Oronsay (Finlay 1997f; Pirie *et al.* 2006; Wright 2007). This synthesis does not necessarily further the quest for the chronology of the Mesolithic period, but serves to demonstrate that without radiocarbon dates it is possible to define these periods by the technological analysis of lithic assemblages, whether they are discrete or palimpsests.

Raw materials
Increase in utilisation of quartz and pitchstone
Primary technology
Regular flakes and smaller percentage frequency of blades
Inreased use of faceted platforms
Cores tend to be more irregular
Increase in use of bipolar reduction
Platform and bipolar reduction of quartz
Secondary technology
Distinctive tool forms: leaf shaped arrowheads, plano-convex knives, fabricators, serrated blades
Scrapers possibly tend to be larger than Mesoithic counterparts
Bifacial retouch
Invasive retouch

Table 2-2: Distinctive technological practice for the Early Neolithic (Warren 2006).

A stated aim of the SHMP was to consider the transition to the Neolithic, although no relevant sites were found (Mithen 2000a, 9; 2000b, 623). The *Inner Hebrides Archaeological Project* 'IHAP' (Mithen nd.; Mithen *et al.* 2007) and the *Southern Kintyre Project* 'SKP' (Cummings 2007; 2010; Cummings and Robinson

2007) potentially gives renewed impetus to research into Mesolithic-Neolithic transition in Scotland. Warren (2004) considered the transition in Scotland in terms of distinctive identities informed by the inter-connections of material culture and the landscape, and the possibility of contact between hunter-gatherers and Neolithic farming communities. Richards (2004) building upon his work with Schulting (and Richards 2002) distinguishes the Mesolithic marine diet from the terrestrial Neolithic diet. The evidence from Scotland is compared and correlates to other similar studies in Britain and Denmark. The samples available of human bone from Late Mesolithic sites in Scotland are small, although much larger dated samples for the Early Neolithic are available in Britain (Richards 2004, 87). Human bone has only been recovered from coastal Mesolithic sites (e.g. the Oronsay shell middens [Richards and Mellars 1998] and Carding Mill Bay [Schulting and Richards 2002]); human remains have not been found at inland sites. Caution must be observed in creating a dietary meta-narrative distinguishing the Mesolithic from the Neolithic based on isotope data from Scotland.

Research into the transition in European studies appears to be robust on the basis of the volume of papers delivered at a conference in Brussels in 2007 (Crombé *et al.* 2009); e.g. dietary distinctions on South-East and North-West Europe (Cook *et al.* 2009; Bonsall *et al.* 2009); a series of case studies from sites in North-West Ireland focusing on climatic and cultural variation (Warren 2009), and environmental perspectives and woodland disturbance associated with early cereal type pollens in Northern England (Ryan and Blackford 2009).

2.3 Regionality

2.3.1 Culture History: case study in defining and redefining regionality

Atkinson (1962) summarised the cultural affiliations of the Mesolithic occupations of Scotland into three broad categories. Firstly, the Larnian represented the lithic assemblages of groups of ‘strandloopers’ occupying the shores on either side of the North Channel of the Irish Sea and the Firths of the Clyde and the Solway. Secondly, the *Tardenoisian* industries bore witness to the movement of people from the Tweed Valley to the Clyde Valley through the Biggar Gap. Thirdly, the biserial antler or bone points were considered to be the type fossil of the 'Obanian' shell middens and cave sites which Clark (1956) determined to be *Azilian*.

When Lacaille published *The Stone Age in Scotland* in 1954, there were approximately 70 to 80 sites [data to 31 January 1952] (Figure 2.3) in Scotland considered to be Mesolithic and less than 20 had been excavated. Some of the assemblages were contaminated with later material, others were annotated as 'stone age', where subsequently it was established that there was no evidence to support a Mesolithic date (Morrison 1996a, 12).

The paucity of sites available to Lacaille meant that certain locations became 'central places' for archaeological investigation and interpretation. The predominantly flint surface collections from the coastal margins of Shewalton Moor and Sands, Ayrshire are a particular case in point. The Mesolithic character of the pieces, which included narrow blade microliths and other forms indicative of broad blade microliths, was considered to be *Tardenoisian*, named after the recoveries from the type site at Fère-en-Tardenois, near Rheims in France (Lacaille 1930; Lacaille 1954, 99). The *Tardenoisian* tradition of microliths, such as the trapeze, replaced the small microlithic forms of mainland Europe at c.6000BCE (Rozoy 1978).

The *Tardenoisian* cultural tradition (Figure 2.1) moved north into south-east Scotland from the Pennines region of England, and through the Biggar Gap into Lanarkshire and Ayrshire (Lacaille 1930; Lacaille 1954, Table VI). Lacaille (1937) published a paper incorporating all of the *Tardenoisian* sites and stray finds of microliths throughout Scotland. It was noted that none of these sites produced any meaningful stratigraphic evidence; principally comprising of surface scatters (Lacaille 1937, 58). The main sites outwith West Central Scotland were recorded at Dryburgh Mains, Berwickshire (Callander 1927), Rink Farm near Selkirk (Mason 1931) and Banchory on Deeside (Paterson 1913; Paterson and Lacaille 1936).

The flint collections from Ballantrae (Edgar 1939; Lacaille 1945) led to Lacaille (1945; 1954) replacing Shewalton as the 'central place' for academic enquiry. The Ballantrae collections formed an integral part of the basis of a re-interpretation of an over-arching regional cultural tradition for the occupations on the Ayrshire coast during the Mesolithic period. Lacaille (1954, 150) examined the pieces from the Edgar collection and drew comparisons to the artefacts and the context of recovery from Rough Island, Strangford Lough, in Northern Ireland. A similarity with certain tool forms from the Campbeltown sites at Dalaruan-Millknowe and Albyn Distillery were also noted (McCallien and Lacaille 1941; Lacaille 1954, 153).

Drawing heavily upon the work of Movius in Ireland the collection was reclassified from *Tardenoisian* to the Mesolithic 'Larnian' of Ireland (McCallien and Lacaille 1941; Lacaille 1945; 1954, 150-156). The main features relating to the re-interpretation of the cultural affiliation are set out at Table 2-3.

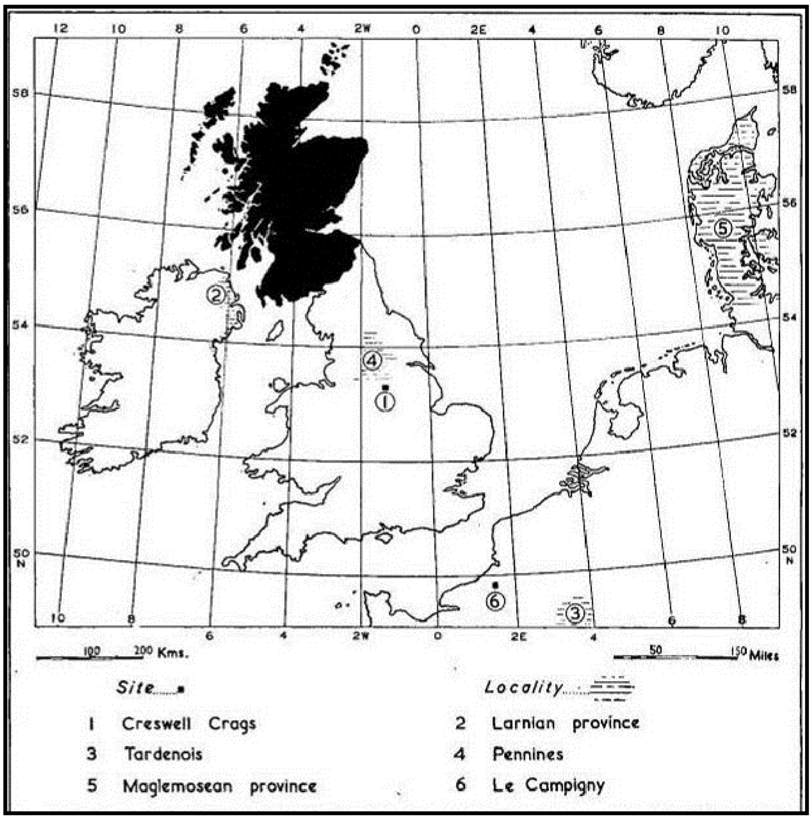

Figure 2.2: Map showing location of type sites for cultural affiliations, apart from *Azilian*, found in Scotland (Lacaille 1954, Figure 140). © Oxford University Press used with permission.

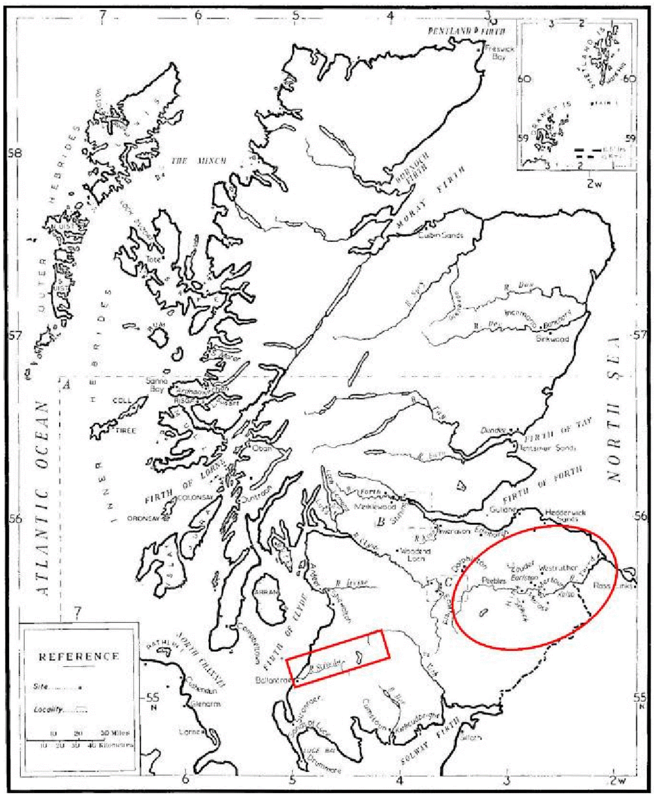

Figure 2.3: Map of Scotland showing sites of "relics of stone age culture" (Lacaille 1954, frontispiece). The research transect is superimposed (cf. Section 4.4) and the surfeit of sites of the Tweed Valley is highlighted. © Oxford University Press used with permission.

Early Larnian of Ireland (McCallien and Lacaille 1941)

- Lithics were recovered from contexts underlying beach gravels, e.g. Cushenden and Island Magee.

Late Larnian of Ireland (McCallien and Lacaille 1941)

- Abraded assemblages were recovered from plough soils overlying raised beach, e.g. Glenarm and Curran Point. The rolled character of the assemblages suggested occupations during eustatic rise in sea levels or during the maximum marine transgression.

Campbeltown, Argyll (McCallien and Lacaille 1941; Lacaille 1945; Gray 1894)

- Predominantly flint assemblage from Albyn Distillery from 7.6m raised beach; raw material thought to have imported from Antrim in Northern Ireland. First recorded instance of microburins recovered from secure context in Scotland. Peat beds underlying raised beach which appeared to be comparable to evidence from Northern Ireland.
- Drawing on Irish evidence it was determined that lagoonal silt and marine gravels could be assigned to Early Larnian, with overlying raised beach gravel representing Late Larnian.
- Albyn assemblage interpreted as Early Larnian and represented the earliest post-glacial colonization in the West of Scotland.

Ballantrae, Ayrshire (Lacaille 1945; 1954; Morrison and Hughes 1989; Charlesworth 1926)

- Assemblage recovered from top soil overlying post-glacial deposits at 6m OD. Referring to Albyn the raised beach indicated marine transgression occurred c.5000-2500BCE. It was assumed that marine transgression in relation to land was broadly uniform for the coasts of Antrim, Argyll and Ayrshire.
- Assemblage predominantly flint with chert, pitchstone, chalcedony and quartz present. Some of the flint displayed evidence of burning, although no firespots or hearth features were noted.
- Proportion of flint would have been imported from Antrim, although flint could be found in drifts from Ballantrae south to Loch Ryan.
- Larnian artefacts were deemed to have been recovered from secondary contexts. Neolithic component was considered to have been collected from primary locations in contexts overlying beach deposits.
- Ballantrae assemblage contemporaneous with Early Larnian.
- Majority of microliths were assumed to have been recovered from primary Neolithic contexts dated to c.2500BCE. This was characterised as representing Epimesolithic occupations

Table 2-3: Summary of the analysis of assemblages in determining the re-interpretation of the Tardenoisian to Larnian cultural tradition.

Lacaille (1948; 1954) considered the Early Larnian of south-west Scotland to represent the initial Mesolithic occupations in Scotland. The subsequent cultural contact with the inland *Tardenoisian* traditions of the Tweedside and Clydesdale industries produced the contemporary 'Advanced Early Larnian' of south-west Scotland.

Coles (1963) deconstructed the coastal Larnian edifice proposed by Lacaille for the Mesolithic of Ayrshire and Cambeltown in Argyll by reference to a stratigraphic re-analysis of the Irish material which was at odds with the evidence from Scotland, although there were instances where chipped stone was considered to have been recovered in contexts similar to those found in Scotland (Table 2-4).

It was argued that the material recovered from these sites was contemporary with the raised beach suggesting that the occupation(s) must have pre-dated Terally, Wigtownshire and Albyn, Argyll, although remaining within the Late Atlantic climatic phase. It was suggested that Larnian terminology for south-west Scotland, a region including the Ayrshire coast, was no longer tenable and proposed a new regional identifier 'south-west Scottish coastal Mesolithic' which sought to avoid any link to any cultural affiliation or chronology (Coles 1963, 93). Woodman (1981) postulated that the industries in Argyll were not comparable to the Early Mesolithic in Ireland.

West Central and south-west Scotland

- Excavated material from Terally characteristically similar to assemblage from Albyn Distillery, Campbeltown recovered from surface of beach gravel and sand. Paucity of pieces displaying evidence of being water-rolled. No typological dissimilarities between fresh and rolled pieces were observed.
- Occupations at Terally and Albyn following commencement of isostasis during Atlantic climatic phase.
- Daluaran-Millknowe assemblages recovered from the raised beach at Campbeltown may represent settlement prior to maximum marine transgression.
- Very few water-rolled pieces were noted in Ballantrae assemblages indicating a post-maximum marine transgression occupation. Microlith component displayed a white patina.
- Wigtownshire assemblages could not be relatively dated to the raised beach. Evidence of possible shell midden material and the immediacy of the transgression, the occupation must have pre-dated the Albyn cluster occurring at or near maximum marine transgression.

Comparanda

- Small blades present in Early Larnian do not occur in Wigtownshire assemblages.
- Typologically Albyn assemblages have greater resonance to the Late Larnian due to presence of a quartz axe and two Larne picks.
- Core or broken end of heavy flint axe from Stairhaven is typologically similar to axe from Albyn.
- Wigtownshire assemblages have closer affinity to finds from Albyn than Larnian.
- There was no evidence to suggest any major connection between western Scotland and north-east Ireland during the Mesolithic period.

Table 2-4: Summary of the re-analysis of the assemblages by Coles (1963) deconstructing the Larnian cultural tradition proposed by McCallien and Lacaille (1941) and Lacaille (1945; 1954).

Setting to one side the 'Obanian', culture historians expressed regionality on the basis of defining coastal and inland occupations in opposition based on the recognition of type fossils. The position is best summarised by Lacaille (1954, 191) when discussing the assemblage from Woodend Loch which "belongs essentially to the inland culture which developed on Tweedside [*Tardenoisian*] as the equivalent of the littoral Larnian of the south-west", is hinting at the continuity of technological practice throughout Scotland during the Mesolithic period by going on to say that the *Tardenoisian* "appears to have flourished with little variation over the whole breadth of Scotland" (*ibid*).

Regardless of the flawed premise adopted during the culture history milieu, the case study demonstrates the longevity of academic enquiry incorporating the analysis of data to attempt to define inter-regional variation against the veil of continuity of technological practice. It also serves to demonstrate how the re-assessment of data can provide further insight into the reconfiguration of inter-regional variation. The granularity of investigation implicitly offered temporal distinctions of intra-regional variation, but did not delve into the nuances of inter-site and intra-site variations (cf. Section 8.7).

2.3.2 Variations in the scale of regionality: the seasonal round

The seasonal round is introduced as an example to explore intra-regional variations within the regional profile.

The notion of the seasonal or annual round was introduced into Mesolithic studies from ethnography (cf. Binford 1980; Figure 2.4), and remains deeply embedded (cf. Jochim 1998). It could be argued that processual academic enquiry attempted to give a structure to the mobile hunter-gatherer communities. Wickham-Jones (2005, 31) notes the notion of a nomadic existence was already ingrained when Childe (1925) published *The Dawn of European Civilization*. The seasonal round was effectively constructed around the functional perspectives of type-sites (Binford 1979; 1980). Campbell (1968) and Binford (1978) detailed numerous variations of Nunamiut type-sites, which Binford (1982) subsequently reduced. Conneller (2005, 43) makes explicit that Binford did not intend to construct an empirical typological meta-narrative, although that did happen (cf. Legge and Rowley-Conwy 1988). The variations in type sites were further conflated in the models produced by Clark (1972) and Mellars (1976). Conneller (2005, 45) highlights potential problems in the interpretation of palimpsests (other perspectives are considered at Section 4.2.2) where variation in tasks may produce common differences in the composition of assemblages (Binford 1978, 473) and sites may be used for different tasks within either a seasonal round or in re-occupations (Binford 1982; Finlayson 1989; Schlanger 1992).

There have been other attempts to define the seasonal movement cycle/social boundaries. For example, Jacobi (1976) initially sought to use microlith typologies. Gendel (1984; 1987; 1989) used microlithic attributes and also considered its relationship to raw materials. The importance of raw materials in the attempt to profile social boundaries is particularly relevant to this study and is discussed further at Section 8.6.4.

The passivity of the normative concept of the seasonal round has been criticised (Jochim 1991; Spikins 1999) focusing on whether or not there is such a thing and if there is, can it be recognised archaeologically (Conneller 2005, 45). The notion of the seasonal round may in itself be variable. The denial of a dynamic to the seasonal round will mask variation in hunter-gatherer group composition or the existence of sub-groups electing to undertake tasks at different times and different locations (Spencer 1976, 133; Jochim 1991, 310; Conneller 2005, 45). The position is summarised succinctly by Conneller (2005, 45):

> "...intra-annual variation is variability occasioned by the differential inter-annual use of the landscape by particular groups. Settlement may vary considerably between different years due to short term fluctuations in resources and/or social relations."

The interpretive understanding of the seasonal round set within the continuity of technical practice may hide aspects of regionality and intra-regional variation with resultant problems for the recognition of identity, group identities and defining social boundaries (Chapter 3).

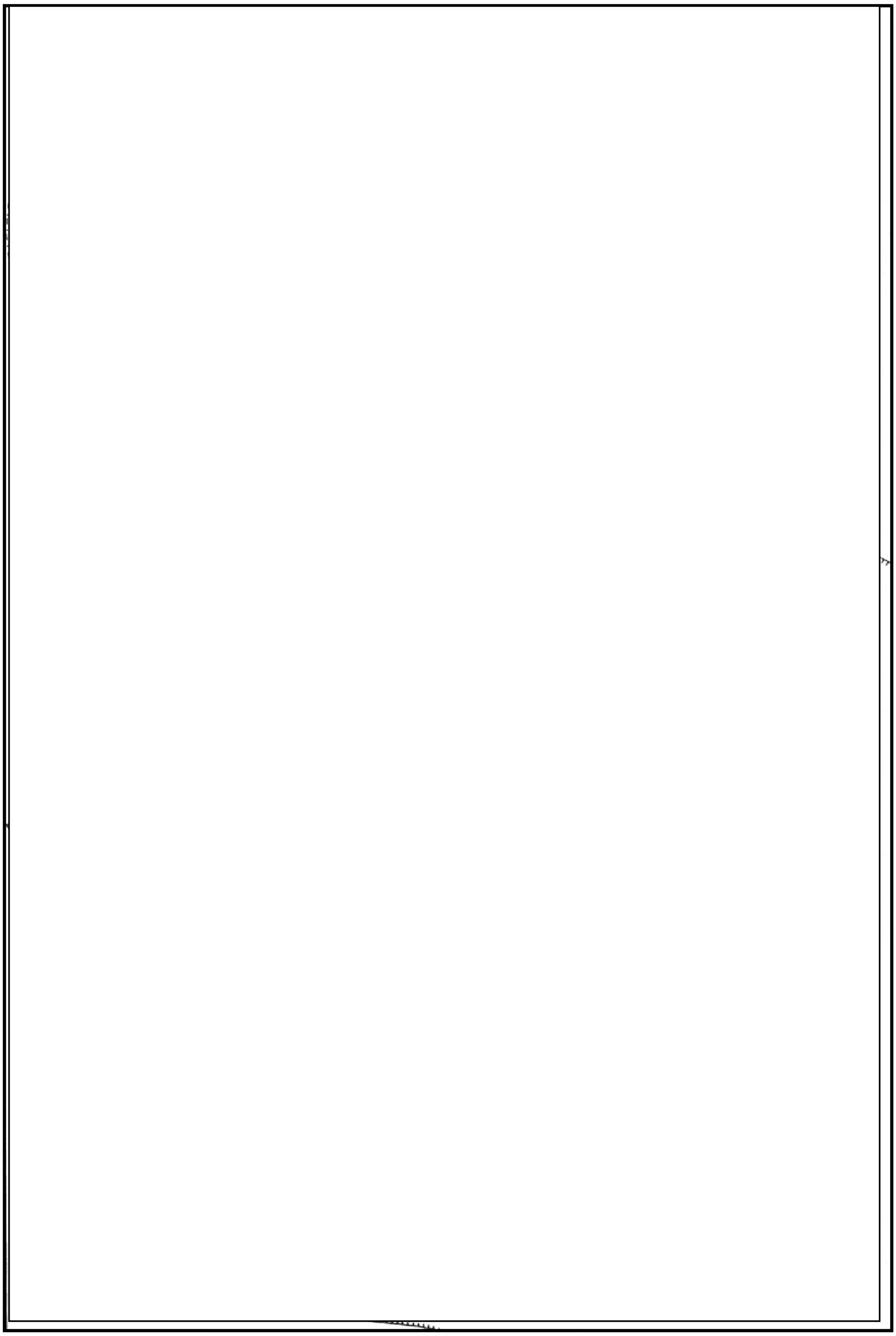

Figure 2.4: Functional characterisation of a normative subsistence-settlement system of the /Gwi San of Botswana's Central Kalahari (Binford 1980, Figure 1).

2.3.3 Current themes on regionality

2.3.3.1 Defining a region

Saville (2003, 340) starts with making explicit the problem of starting with the modern political boundaries of Scotland preferring to consider the macro-region of Northern Britain extending south to the southern parameters of the Peak District. For my own part, the boundary of Northern Britain could be extended to the geographic area north of the Pennines. It seems inappropriate to incorporate the flint rich areas of Yorkshire (Section 2.3.3.2). Saville (2003, 341) goes on to consider the difficulties associated with the recognition of social territories based on the analysis of lithic assemblages, which are generally the only surviving evidence for Mesolithic events outwith shell midden sites.

How do you define a region, within the macro-region, in geographic and/or topographic terms that may have had some resonance to the hunter-gatherers of the Mesolithic? The definition of regions based solely on the common differences in assemblage composition may conflate inter-site, intra-regional and regional perspectives. For example, the region of West Central Scotland has been defined by reference to Bartholomew's (1895) map of the watersheds of Scotland and the River Clyde to the north, including the islands of the Firth of Clyde (Chapter 1). The importance to hunter-gatherer groups of watersheds and topography supported by ethnographic analogy, as indicators of culturally significant boundaries for analysis permeate throughout Spikins (1999) research into the Mesolithic of Northern England.

Discrete regions or social territories are implied, e.g. those sites where bloodstone from the island of Rùm is present in assemblages (Clarke and Griffiths 1990). An approach which resonates with Gendel's (1984; 1987; 1989) ideas of raw material as an indication of social boundaries (cf. Section 2.3.2). It would seem that a similar regionality could be established with pitchstone from Arran. However, the utilisation of pitchstone is more complicated. Mesolithic assemblages from Arran comprise predominantly of flint, e.g. Auchareoch (Affleck *et al.* 1988) and Site 610, Machrie Moor (Barber 1997). Pitchstone appears to occur much later than the Mesolithic period and continues into the Neolithic and beyond. Pitchstone microliths have been recovered in multi-period assemblages at CTSE and CTSF (Donnelly and Finlay nd.). The issue is further complicated in that pitchstone recovered from mainland contexts generally relates to post-Mesolithic activities (Ballin and Faithfull 2009) suggesting variations in the exploitation of pitchstone. Raw materials as a resource for regionality are explored at Section 2.3.3.2.

The regional profile is determined by the *chaîne opératoire* and the technological analysis of micro-phenomena within lithic assemblages demarcating intra-site, inter-site, intra-regional variations. The scale, geographic diversity and nature of the resource are implicit to be able to offer a sustainable and meaningful profile (Section 2.4.2; Chapter 4).

2.3.3.2 Regionality: the diversity of raw materials

A distinctive feature of the Mesolithic in Scotland when compared to southern Britain is in the variation of raw materials used during the Mesolithic period. Flint is restricted to beach pebble and fluvio-glacial resources (Wickham-Jones and Collins 1977; Finlayson 1990; Saville and Wickham-Jones 2010). Finlayson (1990, 44) summarised the situation “while good nodular flint is rare, ‘knappable’ material is not.” The use of other raw materials such as chert, quartz, quartzite, chalcedony, silststone, mudstone, Rùm bloodstone and Arran pitchstone may provide evidence for nuances of variation in the reduction of different materials and demonstrate alternative working traditions [Table 2-4] (Finlay *et al.* 2003, 108; Warren 2001; Wickham-Jones and Hardy 2004). The siliceous ‘blue stone’ recovered from two of the sites at Daer Reservoir is currently unique and not found at any of the other sites in the West Central Scotland.

Variations in the choice of different raw materials may assist in defining a region, and infer movement across the landscape and contact between hunter-gatherer groups (Wickham-Jones 1986; Saville 1994; Finlayson 1989; 1990). The use of quarried chert can create linkages to events in the landscape (Warren 2001; Finlay *et al.* 2003, 108).

Material	Principal Geographic region	References
Quartz	Mainly north, west and Highland Scotland	Ballin 2008
Rum bloodstone	Rum and surrounding islands	Clarke and Griffiths 1990
Staffin baked mudstone	Skye, surrounding islands and mainland	Saville and Miket 1994
Other mudstones	Western Isles and Woodend Loch, Lanarkshire	Saville and Wickham-Jones 2010; Davidson et al. 1949
Skye tuffs	Raasay	Ballin et al. 2010
Radiolarian chert	Southern uplands; fewer occurrences Central Scotland	e.g. Ward 2004a; 2004b
Carboniferous chert	Central Lanarkshire	Davidson et al. 1949; Innes et al. forthcoming
Chalcedony/Agate	Occasional use; mainly Fife and Angus	Coles 1971
Pitchstone	Arran	Ballin 2009; Williams Thorpe and Thorpe 1984

Table 2-5: Table of some of the raw materials found at Mesolithic sites with principal known geographic region (amended from Saville and Wickham-Jones 2010, Figure 6).

Distinctions in the colour, quality and cortical surface of raw materials may give insight into intra-site and intra-regional variations and differences relating to temporal episodes of occupations, notions of identity and group identities (Chapters 6, 7 and 8). The availability of raw materials in West Central Scotland is discussed at Section 4.7.

2.3.3.3 Regionality and the impact of research

Since the 1970s there has been a series of intensive research projects focusing on the Mesolithic period in Scotland. Mellars' (1987) research on Oronsay was driven by ecology; much of the research remains unpublished. Landscape approaches have tended to dominate the research agenda with the SHMP (Mithen 2000), SFS (Hardy and Wickham-Jones 2002; 2003; 2007), *Southern Kintyre Project* 'SKP' (Cummings 2007; 2009; Cummings and Robinson 2007) and the *Inner Hebrides Archaeological Project* 'IHAP' (Mithen nd.). The *Scottish Lithic Scatters Database* (Barrowman 2000; Barrowman and Stuart forthcoming) is a gazetteer for the lithic scatters of Scotland. In addition, to these large-scale projects there have been regional undertakings (e.g. Mercer 1980; Tolan-Smith 2001; 2008; Finlay forthcoming). Site based (Connock *et al.* 1993; Pollard 2000), and development based projects (e.g. MacGregor and Donnelly 2001; Donnelly and MacGregor 2005; MacGregor forthcoming and others) have also featured prominently in the west of Scotland. These scales of recent activity are not seen in the east.

For Lacaille (1954) the surface collections from the Tweed Valley were a 'central place' (Figure 2.3), and Morton, Fife (Coles 1971) still features strongly in discussions of the Early/Late Mesolithic division in Scotland (Section 2.2.1.2), however, since the 1960s research has focused on small-scale site projects (e.g. Kenworthy 1982). Warren's (2001; 2007) work with local societies started to once again highlight the research potential in the east (Finlay *et al.* 2003, 102-103). However, it could be argued that this impetus has since stalled, although as pointed by Finlay *et al.* (2003, 103) rescue archaeology has revealed evidence for Mesolithic occupations (e.g. Wickham-Jones and Dalland 1998; Atkinson *et al.* 1997; 1999; Gooder 2007; Clarke 2007). The sheer magnitude and success of field survey and small-scale excavations undertaken by local societies in South Lanarkshire (Section 2.4.2) is at a level far above anything seen elsewhere in Scotland.

There are three distinct issues arising out of the scale of fieldwork and focus of archaeological enquiry which affect the potential recognition of regionality as variation. Firstly, the distribution of sites does not indicate the diversity of the human experience in Scotland during the Mesolithic but represents the geographic focus from the history of research and/or the survival of sites [Section 2.4] (Finlay *et al.* 2003, 105; Saville 1998). Secondly, there is the general absence of syntheses. Lacaille's (1954) volume remains the only complete synthesis of the stone ages in Scotland (Morrison 1996a, 12). Subsequently there have been a number of overviews, the depth of enquiry does not warrant their description as syntheses, published for Ayrshire and south-west Scotland (Morrison 1982; Morrison and Hughes 1989), and specific sections within geographically larger synthetic and multi-period volumes (Morrison 1980; Finlayson and Edwards 2003 [1997]; Saville 2004a; 2004b). Thirdly, the absence of synthetic publications makes comparanda difficult and can lead to difficulty in constructing generalisations. For example, Finlay *et al.* (2003, 113) state "...regional difference is increasingly apparent in the Mesolithic of Scotland.", which, apart from the 'true Obanian', is largely drawn from variations in raw materials within assemblages. The paucity of regional synthesis may be because there is apparently no consensus in the definition of the regions of Scotland during the Mesolithic period (e.g. contrast Woodman 1989 to Saville 1998). Furthermore, what are the scales of 'regional resources' which are required to define a region? Is the resource, i.e. the lithic collections and assemblages, adequate to sustain this? Are the variations referred to inter-site, intra-regional or truly indicative of a regional profile? Does the nature of palimpsests with phases of events often indistinct, mask the true character and integrity of distinctive episodes of activity; conflating time transgressive social territories?

The extent and nature of coastal regional resources may have to be reconfigured in due course because of a major new research project, which is a consequence of the success in locating submerged coastal Mesolithic sites in Denmark (Fischer 2001), southern England (Momber 2007) and the mapping of Doggerland (Gaffney *et al.* 2007). The nascent *Marine Data Project*, which is under the aegis of the Royal Commission on the Ancient and Historical Monuments of Scotland (Historic Scotland nd.) is to prospect for Early Mesolithic sites that may have been submerged by the marine transgressions of the Holocene. One aspect of the *Rising Tide Project* is currently undertaking similar enquiry in Orkney (Wickham-Jones 2009). Engen and Spikins (2007) considered the potential for developing predictive models using GIS for the discovery of submerged sites at the Inner Sound of north-west Scotland.

2.4 History of research in West Central Scotland

2.4.1 Academic assessment on state of research

Reviews were carried out by Woodman (1989) and Mithen (1999) on the state of academic research into the Mesolithic period in Scotland. Woodman's (1989) paper was negative in tone focusing on the failures of research, while Mithen (1999) chose to highlight those areas where a greater understanding was required (Table 2-5). Young (2000a, 2) summarised Mithen's paper as highlighting our poor understanding of Mesolithic lifeways.

Woodman 1989 • Absence of a sustainable chronology of the Mesolithic period; • Systematic field survey by amateur archaeologists and local societies has created a bias when considering the geographic location and regional intensity of occupations; • Difficulty in locating sites due to peat overburden; • Lack of understanding of economic strategies; and • Early/Late Mesolithic debate in Scotland using the English model. **Mithen 1999** Greater understanding of the: • Diversity of microlith forms; • Economic function of plant resources; • Character of settlement patterns; • Development of predictive models for location of sites; • Human inter-relationship of cosmology, symbolism, ideology and landscape; and • Nature of all facets of the Mesolithic-Neolithic transition.

Table 2-6: Synopsis of issues highlighted by Woodman (1989) and Mithen (1999).

In the intervening years there has been some progress made in the gaps of our knowledge of the period (cf. Finlay *et al.* 2003, 101-102), although noting that progress is slow in the investigation of waterlogged sites, and the construction of a sustainable chronology (Section 2.2). Apart from South Lanarkshire, research into the interior has not been progressed [Section 2.4.2] (*ibid*, 102). Much of Mithen's (1999) targets for future research remain outstanding, however, one of the principal focuses for the *IHAP* (Mithen nd.) and *SKP* (Cummings 2007; 2009; Cummings and Robinson 2007) is the Mesolithic-Neolithic transition. The contributions to recent edited volumes (Milner and Woodman 2005; Conneller and Warren 2006; Finlay *et al.* 2009), although not relating solely to Scotland, they are providing valuable insight into new interpretive approaches to offer a more cosmological and nuanced understanding of all aspects of Mesolithic lifeways.

Table 2-7 sets out papers delivered at *Mesolithic on the Move* (Larsson *et al.* 2003) and *Mesolithic Horizons* (McCartan *et al.* 2009) International Mesolithic Conferences, and solitary contributions to the Brussels conference (Crombé *et al.* 2009) and the edited volume *Mesolithic Europe* (Bailey and Spikins 2008).

Mesolithic on the Move (conference 2000; published 2003)	
Paper	**Author, page numbers**
Palynological visibility and the Mesolithic colonisation of the Hebrides, Scotland	Edwards, K.J. and H. Sugden pp11-19
The origins of monumentality? Mesolithic world-views of the landscape in western Britain	Cummings, V. pp74-81
Microliths and multiple authorship	Finlay,N. pp169-176
Indications of regionalisation in Mesolithic Scotland	Saville, A. pp340-350
Scotland's First Settlers, ... First Results	Hardy, K. And C.R. Wickham-Jones pp369-381
Mesolithic Horizons (conference 2005; published 2009)	
Paper	**Author, page numbers**
Being-in-the-(Mesolithic) world: place, substance and person, etc	Cobb, H.L. pp368-372
Them bones: midden sites as a defining characteristic of the Scottish Mesolithic	Wickham-Jones, C.R. pp478-485
Seasonal resource scheduling in the Mesolithic and Neolithic of Scotland	Parks, R.L. pp521-526
Sounds like Sociality: new research on lithic contexts in Mesolithic Caithness	Mills, S. and A. Pannett pp717-721
The development and historigraphy of pollens studies in the Mesolithic of the Scottish islands	Edwards, K.J. pp900-906
Mesolithic Europe (published 2008)	
Paper	**Author, page numbers**
Mesolithic Britain	Tolan-Smith, C. pp132-157
Chronology and Evolution ..... Mesolithic of North-West Europe (2007; published 2009)	
Paper	**Author, page numbers**
Dietary Trends at the Mesolithic-Neolithic Transition in North-West Europe	Bonsall *et al.* pp517-539

Table 2-7: Papers featuring Scottish material delivered at recent international conferences and contributions to an edited volume.

The perceived paucity of academics using major conferences to highlight ongoing research is interesting and may offer insights into the dissemination of research. Firstly, there is the utilisation of national journals such as the *Scottish Archaeological Journal*, *Proceedings of the Society of Antiquaries of Scotland* and the *Scottish Archaeological Internet Resource*. Secondly, the publication of edited volumes largely devoted to research in Scotland, e.g. Pollard and Morrison (1996) and Saville (2004). Thirdly, university web pages are widely used to release research progress, e.g. *IHAP* (Mithen nd.). Fourthly, it may also speak to a focus on major projects published as monographs either in print, e.g. Mellars (1987) and Mithen (2000), or online (Hardy and Wickham-Jones 2007). Advance notification of ongoing research may be presaged in academic journals and edited volumes. For example, papers released by academics involved in the *SHMP* prior to the publication of the monograph (e.g. Finlayson 1990; 1990a; 1995; Mithen and Finlayson 1991; Mithen and Lake 1996; Finlayson *et al.* 1996; Finlay 1997a; Mithen 2000c).

Where academics working in Scotland have led is in the methodologies for the systematic and detailed analysis of lithic assemblages. The *SHMP*, in particular the work of Finlayson and Finlay (Finlayson *et al.* 1996; 2000), built upon and enhanced the methodologies used by Wickham-Jones (1990) on the assemblages from Kinloch, Rùm (Section 4.2). My use of this suite of analytical applications and terminologies to address the vagarious nature of lithic assemblages allows for the production of comprehensive and sustainable interpretations. Often analysts continue to use their own, arguably inferior, methodologies and terminologies which can often make inter-site comparison almost impossible (e.g. Ballin 2000; MacGregor and Donnelly 2001; Donnelly and MacGregor 2005). Finlayson (1989; 1990; 1990a) incorporated Torrence's (1983; 1989a) concepts of time stress, risk avoidance and the most advantageous use of energy when considering the assemblages from Starr and Smittons. The use-wear analysis of microliths from these two assemblages also proved the multi-functionality of microliths recovered from these inland assemblages (Finlayson 1989; 1990a), moving understanding on from the gendered stereotype of hunting that Finlay (2000, 68) termed "boys and arrows" narratives.

2.4.2 Nature of the resource

The nature of the resources for West Central Scotland to 2009 comprises of over 300 sites discovered by the field survey undertaken by amateur archaeologists (61.98%), research projects (29.07%) and rescue archaeology [8.95%] (Table 2-8; Figure 2.5).

Woodman (1989, 6) recognised the role of the amateur archaeologist and local societies in the discovery of new sites, although he could not have known that the age of the truly dedicated and enthusiastic people who gave up so much of their time and energy to undertake field survey had passed, apart from the work in South Lanarkshire of Tam Ward and the Biggar Archaeology Group 'BAG'. The 1980s was the watershed. By the mid-1980s MacNeill and the McFadzean family, responsible for locating numerous sites in Ayrshire and beyond, were no longer engaged in systematic survey. The anomaly of research discovery in the 1980s reflects Affleck's work in and around Loch Doon. Since then the discovery of new sites in Ayrshire generally relates to the welcome contribution of rescue archaeology.

	Total	Amateur	Research	Rescue
As at 1952	17	14	3	
1953-59	9	9		
1960-69	28	20	8	
1970-79	71	69		2
1980-89	77	12	65	
1990-99	49	28	7	14
2000-09	62	42	8	12
Total	313	194	91	28

Table 2-8: Summary of the number of Mesolithic sites in research area. Data notes those locations discovered by amateur archaeologists, academic research projects and rescue archaeology.

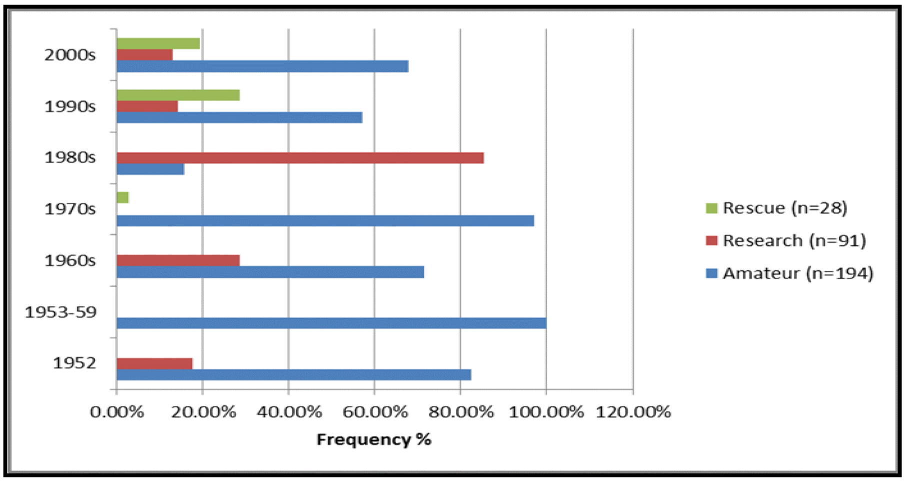

Figure 2.5: Percentage frequencies of data from Table 2-8.

The figures for the discovery of sites in the 1990s and 2000s (Table 2-8) demonstrates the effectiveness of the systematic field survey and small scale excavations carried out by BAG in South Lanarkshire (Table 2-9), with a minimum of four further Mesolithic sites discovered in 2010. Lacaille (1954) was aware of six sites in Lanarkshire, including Woodend Loch (Davidson *et al*. 1949). No further sites were recorded until McFadzean's (1981; 1983; 1984; McFadzean *et al*. 1984) field surveys in Avondale. The family's work was completed by the mid-1980s and the majority of the 21 sites relate to their field survey on the river terraces of the water courses in Avondale (Table 2-7; Figure 2.6). It could be argued that the resource for Lanarkshire is the most comprehensive in Scotland for achieving an understanding for the intra-regional inland occupation during the Mesolithic period. MacNeill's (1973; 1974; 1976) extensive collections from Girvan added to the impressive corpus of material collected on the Ayrshire coast (Section 2.4.3.2).

	Total	Amateur	Research	Rescue
As at 1952	7	7		
1960-69	1	1		
1970-79	1	1		
1980-89	23	22	1	
1990-99	30	21	7	2
2000-09	45	39	1	5
Total	107	91	9	7

Table 2-9: Summary of the number of Mesolithic sites in Lanarkshire. Data notes those locations discovered by amateur archaeologists, academic research projects and rescue archaeology.

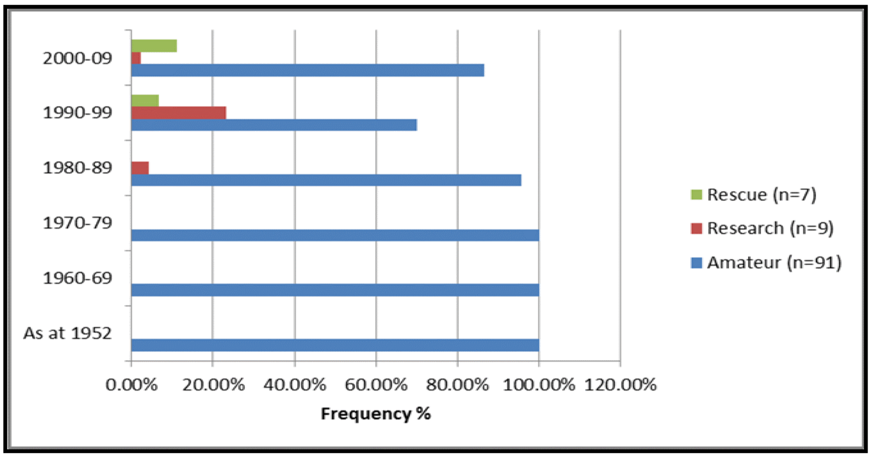

Figure 2.6: Percentage frequencies of Lanarkshire data from Table 2-6.

Only three of the surface collections and excavated assemblages recovered by amateur archaeologists and local societies have been fully published; namely the Edgar collection from Ballantrae (Lacaille 1945), Woodend Loch (Davidson *et al.* 1949) and Corse Law (Clarke 1989). This brings into focus the need for government funded bodies and the academic community to give greater assistance to local societies to deal with this ever increasing backlog of unpublished sites.

2.4.3 Discovering the Mesolithic of West Central Scotland

2.4.3.1 The islands of the Firth of Clyde

Apart from Arran, the evidence for Mesolithic events on the islands of Firth of Clyde has proved hard to come across. The vast majority of the Arran sites are inland, although there are resonances to the coastal sites of Ayrshire. For example, there is the dominance in the utilisation of pebble flint as a primary resource of raw material (after Hughes 1988, 47-50). Statistically, there is a higher incidence of microliths recovered from the Arran sites compared to the Ayrshire coastal sites (cf. Chapter 8).

The nature of the resources comprises of surface collections undertaken by local (Gorman *et al.* 1993; 1995; Allen and Edwards 1987) and visiting enthusiasts (McFadzean *et al.* 1984; Cormack 1986), and academic research survey (Fairhurst 1988 [1981]; Finlay 2003). Excavated assemblages relate to rescue archaeology (Barber 1997; Baker 1999; Donnelly and Finlay nd.), and academic research projects (Affleck *et al.* 1988; Lowe 2008). The collections/assemblages may be characterised as palimpsests of multi-period events including Mesolithic elements, except for the Mesolithic assemblages from Auchareoch (Affleck *et al.* 1988), and Site 610, Machrie Moor (Barber 1997).

Near St. Blane's Church on Bute, there is a surface collection of Mesolithic artefacts including microliths (McFadzean *et al.* 1984; McFadzean 1987). Cormack (1986) collected c.200 patinated and stained flints, including microliths from the top of a bluff near a stream at Little Kilchattan. A notched pitchstone blade fragment from the shore at Shalunt was examined by Saville (2004c), and is considered to be possibly Mesolithic, although it could equally be ascribed to the Neolithic or Bronze Age.

The *Bute Foragers to Farmers Project* was instigated by Nyree Finlay (2003) of the University of Glasgow. The small surface collections indicated Mesolithic elements at Ballianlay, Kerrylamont and The Plan.

A number of flint artefacts were recovered from three locations during the excavations at the monastery at Inchmarnock which may be Late Mesolithic (Lowe 2008, 59).

Fairhurst (1988, 16 [1981]) noted the presence of Mesolithic elements at Auchencairn (referred to as Knockenkelly) and Auchareoch on the isle of Arran. Approximately 1800 lithics were recovered from an eroding quarry face near Auchareoch Farm (Edwards 1996, 118). This upland Mesolithic site was excavated in 1984 (Affleck *et al.* 1988). Oak charcoal from an old ground surface underlying a cairn at Kilpatrick was radiocarbon dated to the Mesolithic period. No diagnostic lithics or other material associated with the ground surface was recovered (Barber 1997, 46).

A field survey project recorded a number of new Mesolithic sites on Arran at Auchencairn, Machrie, The Ross, Drumadoon, and in the Kilmory Water area (Allen and Edwards 1987, 19-24). The 22 sites were mostly inland, near fresh water between 10m-285m OD. Ten of the sites are to found over 100m OD mainly from the Ross and Kilmory Water and Auchencairn areas. The lithic assemblages comprise mainly of flint and pitchstone. The percentile frequency of retouched pieces is low. The microlith component characterises the Mesolithic nature of the lithic assemblage, however, that is not to say that later material is not present. Four pitchstone bipolar cores were collected from one of the upland sites in Auchencairn (Allen and Edwards 1987, 21).

Many of the pieces of flint from Auchareoch have rolled pebble cortex visible (Affleck *et al.* 1988, 46). Weathered flint beach pebbles up to 7cm in diameter have been noted in and around Kingscross Point at Whiting Bay (Allen and Edwards 1987, 21-23). Pitchstone as a raw material is not exclusive to the Mesolithic and was used during the later periods of prehistory (Ballin 2009; Ballin and Faithfull 2009).

Surface collections from Machrie Moor and Kildonan indicted possible knapping sites. The collections were predominantly flint and included microliths suggesting Mesolithic events (Gorman *et al.* 1993, 79; Gorman *et al.* 1995, 72).

Proxy evidence is available for the Early Mesolithic occupation of Machrie Moor. The probable disturbance and burning of vegetation has been dated to 8234-7483BCE [8665±155BP (GU-1427] (Robinson 1983, 1), in the vicinity of a Mesolithic flint assemblage recovered from Site 610 during Barber's (1997) rescue excavations on Arran from 1978-81 (Finlay 1997c, 65). A needle point microlith was found during the excavations at Hut-circle 10/4 Tormore (Finlay 1997b, 29).

The rescue excavations and watching briefs associated with the Arran pipeline discovered a number of locations for Mesolithic activity. The principal site, designated as 'CTSF', produced a mainly flint assemblage of over 14,000 pieces, including a substantial number of microliths and microburins. 32.71% of the microliths are pitchstone which contrasts with 4.76% from Auchareoch (Ballin-Smith *et al.* 1999; Donnelly and Finlay nd.; cf. Table 8-8). A mixed period assemblage, including a Mesolithic component was recovered from a knapping surface at Bridge Farm (Baker 1999).

2.4.3.2 Coastal events: Ayrshire

A synthesis of archaeological sites and finds from each of the 46 parishes of Ayrshire was published by John Smith in 1895, which included sites discovered and artefacts recovered during his extensive and systematic fieldwork.

Smith had recorded his fieldwork and research into the papers and artefacts in the collection of the then Ayr and Wigton Archaeological Association in notebooks from 1880 (Hume 1996, 8; Morrison 1996, 14). His research broadly coincided with the decision by the Society to publish a series of monographs on the archaeological and historical collections from Ayrshire and Wigtownshire. Three volumes (Douglas 1878; 1882; 1885) described artefacts or sites which may have Mesolithic characteristics (Wilson 1878; McDonald 1882). It could be said that Smith was standing on the shoulders of others from the association who had gone before him, for example Wilson (1876; 1878; 1881) collected numerous predominantly flint artefacts from the raised beach at Luce Sands in Wigtownshire. Wilson (1878, 4-5) dismissed suggestions that the raw material had been brought in from Antrim, Northern Ireland, noting the presence of water worn nodules of flint deposited by natural agency. Nodules were also found in amongst stratified gravels and gravel pits at Genoch, Kirkmaiden and Lochnaw Castle. Some years later, Smith (1895, 42) proposed that flint nodules were transported to the Ayrshire coast from Antrim by seaweeds. Charlesworth (1926, 8-9) noted that flint nodules were to be found in the drifts on the coast at Ballantrae south to Loch Ryan, suggesting that the nodules were glacial deposits having been dredged from the Cretaceous sea floor between Arran and the Rhinns of Galloway.

A palimpsest of lithic artefacts, similar to that from Luce Sands, was recovered from the sand dunes, c.37m above the high water mark, on Seabank Moor, near Seabank Farm at Saltcoats on the Ayrshire coast (McDonald 1882, 70). He also reported a shell midden on the raised beach near the harbour at Ballantrae (Smith 1895, 222-223; Lacaille 1946, 87; 1954, 197).

Smith's published works show insight into issues that would be the focus for detailed academic research into the Mesolithic period in Scotland for decades to come (Morrison 1996). With a keen interest in geology Smith (1882, 188; 1908, 40) was aware of the importance of stratigraphy and the precision required in the excavation of archaeological material and how the effects of taphonomic processes impacted on the context of recovery. Smith (1893; 1908) and others have studied the taphonomy at Torrs Warren, a sand dune system at Luce Bay, and noted that artefacts recovered from eroded surfaces were not from their primary locations and represented mixed period assemblages. Callander (1911), in comparing the evidence from Culbin Sands to Luce Sands noted the mixing of artefacts from old ground surfaces due to deflation through wind action; a point emphasised by McInnes (1964, 40), and previously noted by Smith (1908, 40; Morrison 1982a, 5).

Smith's (1896) work in Irvine noted that the survey area had at some time been below sea-level. He also noted that porphyritic pitchstone, some of the pieces having been worked, had been recovered from Shewalton Moor and that the raw material had probably originated in Arran (Smith 1895, 116). Microliths from Stevenston Sands are described and illustrated (ibid, 31; Figure 56), although neither that term nor 'pygmy flint' is used. The pieces were presumably, either recovered from disturbed Mesolithic contexts or were simply residual stray finds. Pygmy flint was an early descriptor for microliths and commonly used until the 1930s and largely out of use by 1937 (Saville 2004a, 8-9).

Mesolithic microlith industries were attested at Shewalton (Lacaille 1930), and from the surface collections at Ballantrae (Edgar 1939). According to Lacaille (1954, 154) the stray finds from Dundonald (Lyell 1863) and at Bartoholm (Smith 1895, 123) indicated the possibility of Mesolithic activity in this area of the Ayrshire coast. In Wigtownshire, Childe (1935, 20) noted that microburins had been recovered from the early glacial raised beach at Stranraer. The character of the artefacts recovered from Luce Sands, which includes microliths, were considered to be similar to the Ballantrae industry (Lacaille 1954, 262).

A biserial barbed point fashioned from red deer antler was recovered from the River Irvine at Shewalton. Lacaille (1939, 49) noted that the piece with a series of five barbs is similar to the largest point from The MacArthur Cave, Oban (Anderson 1895, Figure 11) except that the base is not perforated. The piece was subsequently radiocarbon dated to 4910-4540BCE [Beta-73552 5870±70BP] (Bonsall and Smith 1990, 359). A biserial barbed point of red deer antler recovered from the River Dee at Cumstoun, Kirkcudbright was interpreted as being similar to the Shewalton point (Lacaille 1939, 49), since radiocarbon dated to 4805-4525BCE (6665±70BP OxA-3735). The calibrated dates for the Shewalton and Cumstoun points are temporally indistinguishable (Bonsall and Smith 1992, 29).

The principal focus for the survey for Mesolithic sites and the related surface collections in south-west and West Central Scotland fell to a number of prominent amateur archaeologists (Appendix I) and local district societies. In Ayrshire, Malcolm MacNeill (1965; 1973; 1974; 1975; 1976; MacNeill and MacLeod 1963) found and collected artefacts from 67 Mesolithic or putative Mesolithic coastal sites. The collections were from several recovery locations in the Girvan area from Girvan Mains to Shalloch, comprising of predominantly flint, although there are some chert and quartz lithics. The majority of the sites are situated on the raised beach on sedimentary material from the marine incursion (Morrison 1980, 157). The collections from a number of these locations, including Girvan Mains Farm, Girvan Golf Course, Gallow Hill and Enoch Farm amongst others, have been sampled and analysed (Chapter 5). Between Girvan and Irvine, there were surface collections of flint artefacts from Doonfoot, Maidens, Prestwick and Troon (MacNeill 1965; 1973; 1974; 1975; 1976). The pieces were collected from locations at 9-25m OD, an elevation probably higher than the maximum sea-level (Morrison 1982a, 6; Morrison and Hughes 1989, 10).

A substantial flint scatter was recovered from the coastal site at Ailsa View in the parish of Maybole in Ayrshire (Cook 2002; Gooder 2002). At Gallow Hill, Girvan Mains, previously surveyed by MacNeill (1973) there is an excavated predominantly flint assemblage, including microliths and microburins (Donnelly 1998; Donnelly and MacGregor 2005). At Littlehill Bridge, Girvan a small assemblage of substantially flint artefacts, including microliths was recovered. The focus for the Mesolithic occupation was a scooped area surrounded by turf or banks of earthen material (MacGregor and Donnelly 2001), which is discussed at Section 8.6.3 (Table 2-10; Figure 2.7). The excavated assemblages from Gallow Hill and Littlehill feature in Chapter 5 as a control to the analysis of the MacNeill, Edgar, Gray and Muirfield surface collections.

Excavation of the main scoop feature at Littlehill Bridge, Girvan (Donnelly and MacGregor 2001, 2-6) Fieldwalking revealed two concentrations of lithic material. Excavation was undertaken by GUARD in June 1994. Less than 10% of the area defined by the scatter and charcoal spreads was investigated. Four slot trenches were opened which detected what was either one scoop feature with a number of reconstruction events or several scoops. The main scoop revealed by slot trenches 1 and 4 measured 4m by 3m. Slot trench 3 exposed either an earlier phase of the main scoop or a second scoop. Another scoop was uncovered in slot trench 4. A putative scoop was indicated in slot trench 2; however, because of time constraints the possible feature was not investigated further. The scoop structures were sub-oval in plan, ranging from 6m by 4m to 4m by 2m. The base to the scoop was generally flat with slight undulations, with shallow sides. No internal features were identified, except for a putative slot which was visible in the north facing section of slot trench 3. The stratigraphy of slot trench 1 indicated a primary phase represented by several pieces of worked flint recovered from a basal lining to the scoop of a loose compaction of pink sandy silt. The subsequent phase is identified by a compacted sandy ash ground surface where *in situ* knapping was undertaken. The stratigraphy in slot trench 3 was more complicated and comprised of the impromptu dumping of material. A minimum of three phases of activity were noted for the main scoop. Firstly, the scoop feature was dug out (MacGregor and Donnelly 2001, 2-6). The build up of basal fill, and the lithic material found within it has been incorporated into this phase and not distinguished. Secondly, formation of compacted ground surface associated with an intensified knapping regime. Thirdly, a seriatim of random episodes was associated with the dumping of materials. The possible range of activities undertaken at the site could be expanded when the tipped layer of ash from slot trench 2 is taken into account.

Table 2-10: Summary of the excavation of the main scoop feature from Littlehill Bridge, Girvan (Donnelly and MacGregor 2001, 2-6).

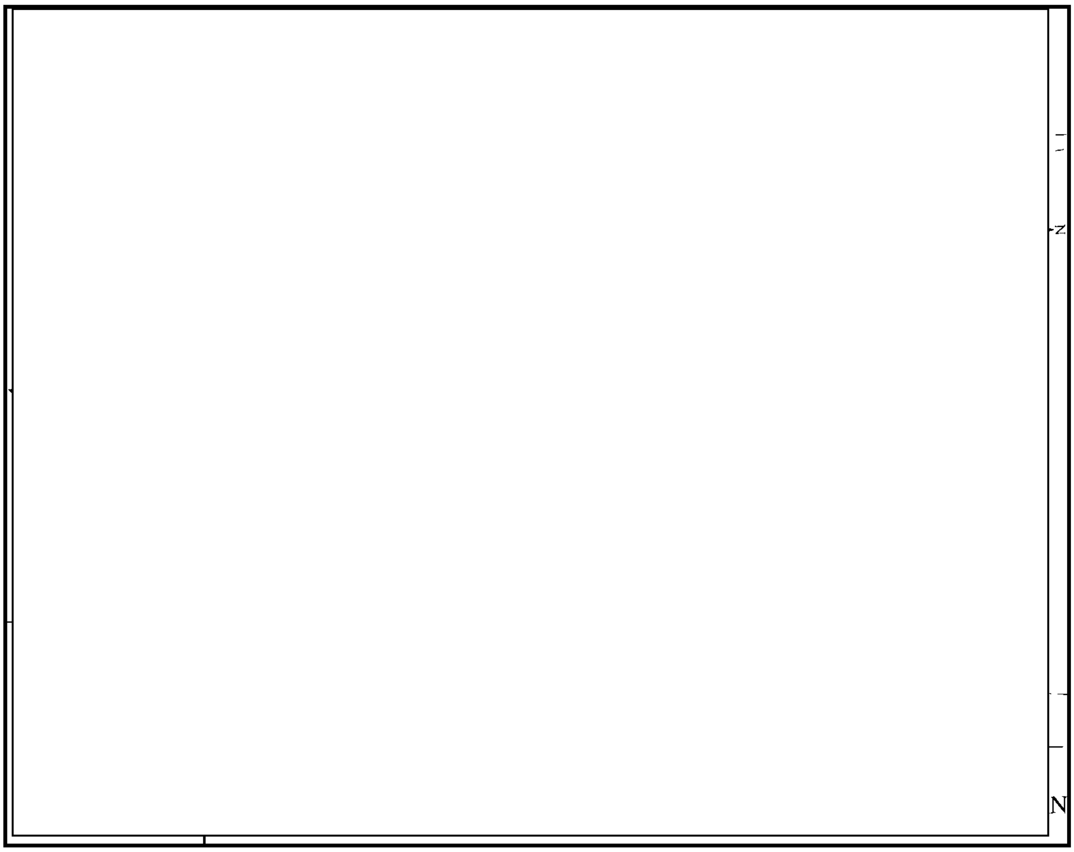

Figure 2.7: Excavation plan at Littlehill Bridge (Donnelly and MacGregor 2001, Figure 3). The main scoop area is (010).

A mixed period assemblage described as mainly Late Mesolithic in character, was recovered during an evaluation at a coastal site in Monkton following a desk based assessment and fieldwalking (Cameron 2000). A mixed period assemblage of c.300 lithics, including Mesolithic elements was recovered from the excavation at the Turnberry Hotel on the Ayrshire coast (MacGregor 2001; Gould 2009). Mixed period assemblages, including Mesolithic elements, were recovered during excavations at Grant's Headquarters, Girvan (Banks *et al.* 2008) and later at an adjacent building Grant's Warehouse 37 (Finlay forthcoming a). A facetted elongated pebble tool was recovered at Girvan Mains (St Joseph and Maxwell 1982). These tools are common finds within the excavated assemblages of the 'Obanian' shell middens (Bishop 1914; Lacaille 1954, 199-245; Finlay 2006b), although they are not a Mesolithic type fossil.

2.4.3.3 Inland events: Ayrshire, Lanarkshire, Renfrewshire/Inverclyde, Dunbartonshire and Loch Lomond

Ansell recorded a number of potential Mesolithic sites at Starr in the uplands near Loch Doon in 1968 and 1969 at 200-215m OD on the east and west shores of the Loch. The surface collections were recovered from locations where fluctuating water levels had eroded the peat cover. Circular settings of stones were also noted (Ansell 1968; 1969). These assemblages from Loch Head, held at the Burgh Museum in Dumfries, have been analysed (Chapters 6 and 7).

The late Tom Affleck (1926-1987), a graduate in Archaeology from the University of Glasgow, following on from the fieldwork of Ansell in 1968-69, undertook further survey work around Loch Doon, Loch Dee and Clatteringshaws Loch, and discovered a number of other potential Mesolithic sites (Affleck 1983; 1984; 1985a). He excavated the upland sites at Smittons [215m OD] (Edwards 1996, 112) Starr 1 (Affleck 1985) and Starr 1A and 1B [220m] (Affleck 1986) and the coastal site at Garleffin (Edwards 1996, 119). Thousands of lithic artefacts comprising of flakes, blades, cores and microliths fashioned from flint and chert were recovered by Affleck from 18 sites on the shores of Loch Doon at c.210m OD. The surface collection was from the land surface where fluctuating water levels had eroded the peat formations (Edwards *et al.* 1983, 9-12). All of the assemblages from these locations have since been lost (Section 4.6.1). Finlayson (1989) undertook technological and use-wear analysis of microliths from the assemblages from Smittons, Starr 1 and Starr 1A (Chapter 7).

The appearance of predominantly chert assemblages was reported at a number of inland sites in Lanarkshire. The chert pieces recovered from Annieston were considered to be of poor quality. Microliths were found at Eastfield and blade industries were noted at Law Farm, Parkhouse and Bagmoors (Lacaille 1954, 188-189). After many years of surface collection at the water's edge of Woodend Loch, near Coatbridge and a number of seasons of trial excavations, a full report of the fieldwork and lithic assemblage was published. William McLean of Low Palacecraig, Airdrie was responsible for the initial surface collections from Woodend Loch dating back to the early 1910s (Davidson *et al.* 1949).

Lacaille visited Loch Lomondside in 1934 (Morrison 1996a, 4). The sites at Shemore and Inchlonaig, near Glenfinlas are described as mixed period assemblages with Mesolithic elements. Two quartz axe tranchets described as *Maglemosian* were considered to be similar to artefacts found in the Tweed Valley (Lacaille 1940, 6-8; 1954, 195). Surprisingly, these artefacts do not feature in Ballin's (2008) synthesis of quartz in prehistory. It is unlikely that any of the artefacts were Late Mesolithic and probably represent later occupations.

During the early 1980s the McFadzean family undertook fieldwork between Muirkirk and Strathaven in Avondale. The survey focused on the river terraces of the Avon, Glengavel Water and the associated tributary streams. A wide range of raw materials was noted, including flint, radiolarian chert, quartzite, vein quartz, pitchstone, mudstone, agate and jasper. The collections were reported to comprise of flakes, blades, burins, scrapers, core scrapers and geometric microliths. A number of Mesolithic sites including the scatter sites at Powbrone Burn, Avondale were recorded (McFadzean 1981; 1983; 1984; McFadzean *et al.* 1984; Morrison and Hughes 1989, 12). The assemblages from the two lithic sites on the western terrace above Powbrone Burn (240m OD) form part of the inland corpus of material analysed (Chapters 6 and 7).

The *Daer Reservoir* and *Daer Valley Projects* have discovered seven attested Mesolithic scatter sites at Daer Reservoir [340m OD] (Ward 1997; 1998; 2000; 2001; 2003) and Daer 84 and Daer 85 in the Daer Valley [340m OD] (Ward 2004a; 2005; 2005b), and surface collections from numerous sites. Mixed period assemblages were recovered from Weston Farm [250m OD] (Ward 1998; 1999; 2000; 2003; 2006; McCartan 1998), Corse Law (Clarke 1989), Brownsbank Farm (Ward 2005), Nether Hangingshaw Farm (Ward 2005a), Cornhill [210m OD] (Ward 1991; 1995; 1996; 1997; 1998; 1999; Archer 1985) and Megget Reservoir (Ward 2004). A number of these sites have since been excavated. The *Upper Tweed Archaeological Survey Project* collected a number of pieces of chert considered to be Mesolithic from Talla Reservoir (Ward 2004b). Microliths were collected at North Deanhead, Dunsyre (Archer 1998), Green's Farm (Archer and Borthwick 1999), Carwood Farm, Biggar (Ward 1999) and Charleston Farm, Lanark (Archer 2000). In 2008 a chert quarry was investigated at Broughton Village. A radiocarbon date of 4226-3961BCE (5220±35BP) was obtained from hazel charcoal recovered from the base of the quarry face (Biggar Archaeology 2010).

The assemblages from Daer 84 and Daer 85, together with sampled assemblages from Daer Reservoir and Weston have been analysed (Chapters 6 and 7).

The *Daer Project* commenced in 2010. Field survey undertaken by BAG found numerous sites in the Daer Valley. Initial findings suggested lithic scatter sites at Daer 86, Daer 87, Daer 88 and Daer 89. Excavations have been completed at Daer 86 and are ongoing, as at June 2011, at Daer 89. Mixed period assemblages, including Mesolithic elements, have been recovered (Biggar Archaeology Group 2010a; 2010b; 2010c).

A geophysical survey project undertaken by the University of Glasgow over upland lithic scatters at Garvald and Garvald Burn were attested by trial trenching and considered to be Mesolithic in character (Sharpe and Barrowman 1998; Barrowman 1998; 2000a). The *Blackhouse Burn Environs Project* discovered an upland Mesolithic knapping surface at Carmichael which may have been associated with a hearth and a windbreak or cooking structural feature (Lelong *et al.* 2005). There were other Mesolithic pieces recovered from the Carmichael Estate (Lelong *et al.* 1999; 2005). An assemblage from Weston is considered to contain broad blade microliths suggesting an Early Mesolithic date based on the English model (Barrowman forthcoming).

At Cloburn Quarry, a mixed period assemblage, including microliths, was recovered (Lelong and Pollard 1998). During the excavations of a multi-phase settlement at Crookedstane Farm, a number of chert pieces were considered to be Mesolithic in character (CFA 1991). Two predominantly chert Mesolithic assemblages, were found underlying later penannular turf-banked enclosures, namely Glentaggart (Ballin and Johnson 2005) and Climpy (Innes *et al.* forthcoming; Innes and Duncan nd.; Wright 2008). The analysis of the assemblage from Climpy forms part of the inland corpus of material (Chapters 6 and 7). A mixed period assemblage, including flint microliths, was recovered at Lang Wang (Archer and Taylor 1987). The only evidence for the Mesolithic in Glasgow comes from the recovery of a residual microlith from the excavations in Drumchapel of a Neolithic structure with Bronze Age phases of activity (MacGregor and Cullen 2003, 122).

There is evidence of Mesolithic occupations at The Carrick, Loch Lomond (MacGregor forthcoming; Ballin forthcoming). Prior to this Finlay (forthcoming) makes the point that until these discoveries there were only proxy evidence for Mesolithic activity in the area from radiocarbon dates obtained from pollen cores (Dickson *et al.* 1978). A Mesolithic presence was recorded in three locations at The Carrick, namely Sites 5.1, 5.2 and 5.3 suggesting a series of activity areas. In Area 5.1, dated to 8500-7500BCE, there is evidence for a possible sunken dwelling, reminiscent to those features at Littlehill Bridge (MacGregor and Donnelly 2001; Table 2-10; Figure 2.7), Barsalloch (Cormack 1970) and Low Clone South (Cormack and Coles 1968). A second phase of Mesolithic occupation, 7500-6500BCE, was represented by five or six intercutting pits with four or five episodes of burning. These pits, termed Pit Group B, are located adjacent to the sunken dwelling. The pits appear similar to the intercutting hearths at Mount Sandel in Northern Ireland (Woodman 1985; Bayliss and Woodman 2009). The lithic assemblage, although small, contains microburins and microliths (G. MacGregor pers. comm.; forthcoming).

There has been a paucity of evidence found for the Mesolithic of Renfrewshire and Inverclyde comprising of several possible Mesolithic patinated flint blades recovered from the raised beach at Bishopton, Irvine (MacNeill and McRae 1994; Alexander 1996, Figure 2). A putative Mesolithic awl was found on the shore of Gryfe Reservoir identified from an upland mixed period collection (Newall 1966; Alexander 1996; Finlay forthcoming). Field survey undertaken by Newall (1960; 1961; 1963; 1965; 1966; 1967) discovered a number of other possible Mesolithic sites in Inverclyde.

There is only proxy evidence for the Mesolithic occupation of Dunbartonshire. The excavation of a vitrified fort at Old Kilpatrick exposed charcoal from the earliest occupation level which was radiocarbon dated to 5110±1020BCE (GaK-2467). The surface was described as possibly Mesolithic by the excavator (MacKie 1969). There are issues with dates provided from this laboratory (Spriggs and Anderson 1993; Ashmore 2004). Evidence of burning at 198m OD on Craigmaddie Moor, which may have been anthropogenic, has been dated to 5475BCE (Dickson 1981, 17).

2.5 Environmental: isostasis, eustasis and woodland disturbance

2.5.1 Isostasis, eustasis and habitat reconstruction

This section considers research into determining sea-level changes and the construction of environmental habitats at Ballantrae and Girvan. The stability of the various habitats at Ballantrae and Girvan coupled with the evidence from Littlehill Bridge, Girvan (MacGregor and Donnelly 2001), which invites notions of sedentary settlement, is particularly important in attempting to understand these locations as taskscapes during the Late Mesolithic period [Jardine and Morrison 1976; Morrison 1980, 155] (Chapter 8).

Recent research into the stratigraphy of the Girvan embayment north east of Enoch Farm was undertaken to attempt to establish the pattern of changes in sea-levels. The work confirmed Jardine's (1975) findings that the rise in sea-levels in relation to the land occurred c.7500BCE-c.4800BCE. The later date equates to the main post-glacial shoreline at c.6.87m above mean high water spring tide 'MHWS'. Overlying the main post-glacial shoreline is the Blairdrummond shoreline (3800-2500BCE) at c.6.03-7.00m MHWS; regressing from c.2200BCE (Smith *et al.* 2006; 2007).

Beach deposits to the north and south of the River Stinchar at Ballantrae were deposited during the main marine transgression. The River Stinchar flows into the sea through a gap in the gravel bar (Jardine and Morrison 1976, 192), although Ting (1937) noted the morphology of the gravel bar has significantly altered during the historical period. There is no evidence for the development of coastal marshes after the maximum marine transgression. The thin layer of blown sand on the raised beach to the north of Ballantrae may have prejudiced the potential Mesolithic occupation of the area. To the south of Ballantrae, the area is more sheltered and there is no evidence of sand cover (Jardine and Morrison 1976). It is perhaps not coincidental that occupation areas focused to the south of the River Stinchar.

Lagoonal sediments have been recorded in the Girvan area of Ayrshire. These sediments have come from embayments which were separated from sea by temporary ridges of silt, sand and gravel (Jardine and Morrison 1976, 179). During the maximum marine transgression, the incursion created an embayment between Girvan Mains and Enoch Farm, which penetrated up to c.4km inland into the valley of the Water of Girvan (Jardine 1962; 1971; 1975). The lagoonal waters of the embayment were at times separated from the sea by the sand/gravel spit or bar. The interaction of estuarine, marsh and marine environments as the sediments built up at the mouth of the Water of Girvan created a continuous barrier, and occasionally a discontinuous series of shoals (Jardine 1962, 275). At the time of the maximum sea-level in relation to land at c.4890BCE, Girvan Mains would have been a peninsula with the sea to the west and the lagoonal embayment to the east (Figure 2.8; Morrison and Hughes 1989, Figure 2).

Figure 2.8: Reconstruction of the lagoonal and estuarine environment in Girvan area from the augur surveys undertaken by Jardine. Sediments caused an embayment from Girvan Mains to Enoch (Morrison and Hughes 1989, Figure 2).

2.5.2 Woodlands: emergence and disturbance

The post-glacial tundra was transformed with birch colonising the south and covering most of Scotland by c.9530BCE. Hazel and oak similarly could be found almost all over Scotland by c.8030BCE with elm by c.7530BCE (Edwards and Whittington 2003, 66-67). Mixed woodland with oak dominant would have covered southern and central Scotland by c.8000BCE, with a greater proportion of birch, hazel and pine in the upland areas (Warren 2005, 54; Tipping 2004, 46). The woodlands were not densely forested and would have comprised of diverse habitats with open glades (Tipping 2004, 46).

The presence of carbonised hazelnut shells demonstrates the importance of this food resource for hunter-gatherers (cf. Coles 1971; Mithen and Finlay 2000; Mercer 1971; 1974; 1980; Affleck *et al*. 1988; Wickham-Jones 1990). The colonisation of scrub hazel may have been natural, although anthropogenic activity using fire, utilising ethnographic data, has also been considered for the spread of this resource (Edwards and Ralston 1984, 16; Smith 1970; Mellars 1976a; Simmons *et al*. 1981). Similarly human agency may have been a factor in the expansion of alder and scrub hazel and the decline of arboreal hazel, birch and pine at the Boreal/Atlantic transition. It is only possible to highlight the prospect because the broad understanding of vegetation changes is difficult to see at site level (Edwards and Ralston 1984).

The evidence of burning in the form of macro and micro-fragments of charcoal does not necessarily indicate an anthropogenic origin. Micro-fragments may be a result of either air or water borne carry, or an *in situ* event. Charcoal may indicate the importance of fire to explain vegetation fluctuations rather than the frequency of burning episodes (Edwards 1990, 71).

A number of palynological studies in south-west Scotland have indicated burning episodes from the recovery of charcoal and proxy evidence for Mesolithic events (e.g. Robinson 1983; Birks 1972; 1975; Edwards 1989; Jones *et al*. 1989; Gregory 2000; Tipping 1995 and others). There are very few locations where anthropogenic origin is attested. Gregory (2000) notes two cases in south-west Scotland, namely Burnfoothill Moss and Loch of Glenhead, and Edwards (1989, 148) cites Moss Raploch close to the eastern shore of Clatteringshaws Loch, albeit with caveats. The evidence from Loch Doon indicates that charcoal was temporally aligned with the increase in alder pollen values, although it is impossible to determine an underlying connection (Edwards 1990).

There is a growing and developing canon of research from the British Isles, the North Sea coast of mainland Europe and the Baltic region for the recovery of early type cereal pollens, distinguished from wild grass pollens, associated with woodland disturbance for 5100-4480BCE and in the vicinity Late Mesolithic activity areas (cf. Crombé *et al.* 2002; Innes *et al.* 2003; Innes and Blackford 2003; Innes *et al.* 2003; Blackford *et al.* 2008). The evidence from Scotland is more problematic. Early type cereal pollens were recovered from Auchareoch, Arran from the same levels as lithics attributed to the Mesolithic period. The disturbed soil matrix means that the assigning of a Mesolithic provenance for the pollens cannot be unequivocal (Affleck *et al.* 1988). Radiocarbon dates associated with the recovery of early type cereal pollens provide potential proxy evidence for proto-agricultural activity during the Mesolithic period at Machrie Moor on Arran, North Mains in Perthshire and Rhoin Farm, Campbeltown in Argyll (Edwards *et al.* 1986; Innes *et al.* 2003).

2.6 Summary

The environmental and archaeological evidence from Girvan facilitates enquiry into the possibility of sedentary occupation in these rich and stable habitats of the Ayrshire coast during the Mesolithic period (Chapter 8).

This chapter has highlighted the nature of a rich resource of unpublished data comprising of surface collections and excavated assemblages in West Central Scotland. The variety of sites and the diversity of raw materials used across the region permits investigation to ascertain variation at intra-site, inter-site and intra-regional scales. These scales of investigation (Section 4.2) also allow for the recognition of differences in technological practice, identity, group identities and possible links across the taskscapes of West Central Scotland culminating in the construction of a regional profile of variation.

Chapter 3: Theory of technology and variation in practice

3.1 Introduction

Bernard Knapp (1996, 151) referencing the work of Julian Thomas (1990) and Alison Wylie (1993) states that:

> "If postmodernism has taught us anything important, it is there are alternate ways of knowing, conceiving of, and writing about, the past."

Postmodernism regaled against the hopeless quest for 'true' knowledge. Knapp (1996) notes that if there is no solitary truth or explanation there can only ever be *an* interpretation. The diverse and fragmentary nature of the archaeological record determines that it is possible to improve and build upon our partial understanding of the past, but it can never be absolute. Walsh (1990, 280) notes that a word may elicit a multiplicity of unique meanings to different people, which requires what Knapp (1996, 137) describes as "theoretical and methodological pluralism". Any research agenda must incorporate different and multiple perspectives as part of a wide framework of interpretive approaches to empower the archaeologist to produce a nuanced, critical and comprehensive understanding in the development of alternate pasts.

The keywords of my theoretical approach are technology and variation. Dobres (2000, 47-48) explores the complexity of the reconceptualisation of prehistoric technology; the points raised may be said to apply equally to variation. Firstly, philosophers and archaeologists view these notions of technology and variation as valid themes for detailed enquiry. Secondly, both disciplines reflexively seek to understand the human meaning of those terms. Thirdly, the intellectual base for academic enquiry reaches back to its beginnings during the Enlightenment, through industrialisation and into the computer age (Dobres 2000, 47-48).

This chapter may be described as a *bricolage*, which will explore the theoretical meaning of variation and technology within the context of the thesis to understand, conceptualise, and contextualise those terminologies. Using the philosophy of Gilles Deleuze, and to a lesser degree his later work with Felix Guattari, the conceptualisation of variation helps us to give meaning to the variation and difference in lithic assemblages, and incorporates themes of identity, group identities, agency, practice and structuration. Variation is a key to our understanding of technology. In the sections that follow the meaning of technology is traced from its beginnings in the Enlightenment to the modern day. There is an attempt to define technology as it may be understood for the Mesolithic period. Using philosophical, social theory, archaeological and anthropological perspectives technology will be shown to be fundamental to the quest for an understanding of concepts such as the social body, social territories, identity, group identities and agency. The *bricolage* does not offer a meta-narrative for understanding all aspects of the prehistoric experience; rather it serves as a structure to explore notions of Mesolithic lifeways, including aspects of identity and group identities from the material culture of West Central Scotland. The *chaîne opératoire* is explicit.

A number of theoretical approaches incorporated within Mesolithic studies, e.g. landscape, settlement and subsistence, identity, and gender will be critically reviewed and discussed to determine how these constructs can be understood by reference to technology and variation. The *bricolage* is fundamental to deal with my research aims and objectives and to understand how identity and group identities may have been forged. It is from the material culture of the hunter-gatherer groups that it may be possible to determine social territories and give meaning to events in West Central Scotland during the Mesolithic period.

It may be prudent to explain why the Deleuzian philosophy features so strongly in the structure of this study. His work has been largely ignored in archaeology, except for the concept of rhizomatics which has been used for discourses on archaeological interpretation and the structure of thought (cf. Shanks 1992; Tilley 1993a; Shanks and Hodder 1995; cf. Section 3.3.3.3). It has also been incorporated into aspects of landscape and taskscape theory (e.g. Conneller 2000a; cf. Section 3.2.5.2). Deleuze is widely recognised as one of the truly great philosophers of the 20th century, as can be seen in the sheer volume of academic research into his writings, e.g. recent volumes include Williams (2003), Colebrook (2006), Buchanan (2008) and major edited volumes such as Bell and Colebrook (2009) and Jensen and Rödje (2010). Foucault (1970, 885) wrote, following the publication of *Difference and Repetition* (Deleuze 2004 [1968]), that:

> "one day, perhaps, this century [20th] will be called Deleuzian".

Foucault while attesting to the quality of his philosophical insight, Deleuze (1995 [1990], 4) self-deprecatingly pointed out that the statement was also meant as:

> "a joke to make people like us laugh, and make everyone else livid."

The particular reason for using Deleuze has been succinctly put by Derrida (2001, 192-193) writing after Deleuze's death in 1995, where he summarised *Difference and Repetition* as:

> "[Deleuze speaks of] ...an irreducible difference in opposition to dialectical opposition, a difference "more profound" than a contradiction...."

Where others recognise variation, Deleuze sought to explain and give meaning to variation as a concept from repetition within the social dimension.

This chapter is effectively split into two major themes, namely technology and variation. There are terminologies and concepts which should be presaged here because they are referenced in 'technology' (Section 3.2), although they are only fully discussed in 'variation' (Section 3.3). Repetition, difference and becoming were developed by Deleuze (2004 [1968] as theoretical constructs. Parr (2010a, 226) writes that:

> "repetition is the creative activity of transformation.... and an understanding of difference."

Transformation is 'becoming', which is the dynamic between unique events as a continuous seriatim of variations; coalesced in becoming (Stagoll 2010, 25-27). Immediately there is a tension which is highlighted in using abstract notions of the 'living' to offer an understanding of, say, identity in the past. A blank struck from a core is an event of 'becoming'; a moment of the past present, which is representative of ‘being’ in the life or becoming of the person working the core and in creation of the lithic and the lithic scatter. ‘Being’ in this sense reconfigures phenomenology as epistemological (after Foucault 2004 [1963]; Deleuze 1999 [1986], 88-89). Becoming for the blank is understood through the *chaîne opératoire* and speaks to the source of the raw material, the opening of the pebble or nodule and the tasks undertaken in fashioning and preparing the core prior to removal, the moment of its actualisation and its use and place of discard. Becoming signifies the connections across the landscape and creates the taskscape.

3.2 Technology

This section comprises of six main divisions which focus on how technology and its relevance to enquiry into the human experience of ‘becoming’ in the Mesolithic period has developed in archaeological studies:

- The origin of the standard view of a passive technology is explored, where technology is regarded as an object of study privileging production and use;

- How unsustainable notions of environmental and technological determination and adaptation developed from the prominence given to the evolutionary trajectory of the standard view of technology;

- The adoption of the *chaîne opératoire* pioneered social theory in lithic studies. Agency is introduced and other approaches are explored through the debate of ‘style versus function’, which incorporated the concepts of agency, practice and structuration;

- Theoretical constructs imported from Anthropology are considered, and how they have been absorbed into archaeological discourse to provide research frameworks to investigate and understand the ‘meaning of things’;

- The development of approaches to landscape studies, including settlement and subsistence, is reviewed culminating with the incorporation of the *chaîne opératoire*, and how it is an embodied technology that creates meaning in the landscape; and

- The spectre of identity is present in those sections on social theory, the ‘meaning of things’ and landscape. The latter provides an introduction into what may constitute identity through social boundaries demarcated by technological practice. The difficulties in the definition of social boundaries in the Mesolithic period are discussed. Current archaeological perspectives on the theme of technology and identity are considered.

3.2.1 Introducing technology

The passivity of technology where objects were considered to be representative of the evolutionary linear seriation of tools across time and space is largely a product of the social evolutionary theories from the Enlightenment. The standard view, where production and use are privileged, has been effectively propelled back to the commencement of human ancestry (Dobres 2000; 2001). In 1734, Mahudel made mention of the concept of a series of consecutive ages of stone, bronze and iron. During the early 19th century Thomsen organised the national collection of Denmark on the basis of the three age system (Trigger 1989). Trigger (1989, 75) makes the point that Mahudel speculated about the notion of three ages, and by the time of Thomsen there was evidence to support the hypothesis. In the mid-19th century Boucher de Perthes published his work on the stratigraphic association of stone tools with the remains of extinct fauna. From the mid to late 19th century, Montelius enhanced Thomsen’s seriation approach, and developed typology (Trigger 1989). A typology for the Palaeolithic period in France was produced by Breuil in 1912 based on the technological attributes of lithic and organic objects (Dobres 2000, 17).

Hegmon (1998, 266) infers that it was Lechtmann writing in 1977 that first made explicit that it is through the social and cultural idiom that technology is given meaning. For example, the importance of this approach may be understood where the perceived simple stone technology of the Aborigines of Australia denigrated those indigenous communities in evolutionary terms. This defined the social dimension of Aborigines in terms of technological complexity, and overlooked the intricacies, nuances and cultural sophistication of their social and kinship systems, and their belief systems, e.g. the dreamtime (Ingold 2000, 313; Ingold 1988; Morton 1988; Testart 1988). Dobres (2000, 32-33), referencing Blumfiel (1991), determined that the standard theoretical view of prehistoric technology was generally confined to inaccessible realms where behavioural practice was obfuscated within an "alienated technological milieu" (Dobres 2000, 33), or what Dietler and Herbich (1998, 237) described as a focus on style, function and technology as separate lines of academic enquiry. Conkey (2006, 355) also criticised this approach making explicit the entanglement of style, design and function.

Prehistoric technologies were not contextualised to a given historical epoch. The passivity of material culture has its roots in a culture history approach, e.g. Childe (1925; 1935), where things designated as type fossils were associated with specific ethnic groups referred to as archaeological cultures (Hegmon 1998, 266). Binford's (1966) work on the functional aspects of *Levallois* assemblages from the Middle Palaeolithic determined that breakage and discard patterning were more instructive than type fossils.

The standard view of technology speaks to concepts understood in terms of a modern technological age, where the practical processes of making and using objects are privileged (Pfaffenberger 1992; Dobres 2000, 10). Dobres (2000, 10) drawing on the work of Ingold (1988a; 1993a; 1995) and Reynolds (1993) makes the point that modern notions of materialism and western rationalism are unable to provide insights to understand prehistoric technologies, where the symbolic and socio-political resonances of working stone simply cannot be accommodated within a reductionist view of technology (Pfaffenberger 1992). The standard view of technology, i.e. in its restricted sense, conceals the significance of each stage of the *chaîne opératoire* (Ingold 2000, 94; Warren 2006, 13-15; cf. Section 3.2.3.1). The lithic assemblage was divorced from its historically constituted social context.

3.2.2 Technology: technological and environmental determinism, adaptation and neo-evolutionism

A synopsis of the development of theoretical approaches incorporating technological and environmental determinism, processual archaeology, adaptation and neo-evolutionism is shown at Table 3-1.

Development of theoretical approaches
- Typology;
- Stratigraphy determined the relative age and environmental contexts associated with assemblages;
- Interpretation was considered to be bounded by environmental, technological and demographic constraint (Clark 1972, 1);
- Ethnographic analogy from 1980s to inform and construct behavioural models and socio-organisation patterns based on the paradigms of structural functionalism and cultural ecology (e.g. Sahlins and Service 1960); leading invariably to interpretations founded in the unsustainable constructs of cultural and environment determinism (cf. Croll and Parkin 1992).

Technological Determinism
- Schick and Toth (1993) viewed the members of society as being shrouded in technology. The making and use of tools were reduced to ahistorical essentialist constructs in opposition to the social dimension, separated from contexts where the people who made and used those tools are simply passive respondents (Drygulski Wright 1987, 9 referenced in Dobres 2001, 234);
- This technological determinism may be explained by Marx's (1926 [1883]) model of alienation, where the powers of industrialisation and society's needs forced the workers not only to be disconnected from the products they made, but also from each other and their own humanity (Dobres 2000, 35).

Environmental Determinism
- From the 1970s to the 1990s, environmental determinism was much in evidence where a given environmental context together with the available prehistoric technological competences permitted the construction of patterns of technological organisation within economic and foraging models (Nelson 1991, 59-60; Dobres 2000, 35-36; Binford 1980).

Processualism
- Scientific approaches which favoured a repeatable analytical experimental basis where the rational and methodical were considered to be of greater benefit and, therefore, were privileged over the social aspects of technology. This processual hierarchy sought to create a reality of the past in the present; ignoring the social dimension and the nature of being (Schiffer and Skibo 1987; Nelson 1991, 81; Dobres 2001, 37;
- It may be argued that this hierarchy with the inaccessibility of the social dimension from the archaeological record was no more than a rewriting of Hawkes' (1954) culture historical 'Ladder of Inference'. Examples of these approaches may be found in the 'function: style' debate of the 1970s, 1980s and 1990s (cf. Section 3.2.3.2);
- Nature was considered to determine and restrict human action. Cultural, economic and technological structures were responsive to, and conditioned by environment factors to guarantee survival (Binford 1965; 1968; Clarke 1968; Rowley-Conwy *et al.* 1987a, 2-3; amongst others). The material quality of artefacts was deemed to be representative of the choice of raw material, techniques of manufacture, and the form and function of an artefact;
- The cultural inference on design features was judged to be less meaningful, and not as worthy of initial academic enquiry. The physical properties of the artefact were understood in opposition to the cultural factors, which were meant to represent a heuristic device to facilitate and increase the possibility of understanding (Dobres 2000, 37-38).

Adaptation and Neo-Evolutionism
- The Neo-evolutionism of the 1950s and 1960s focused on technology as an object; it was how people adapted to their environment (Clark 1953; White 1959), what Binford (1968, 272) described as the "extrasomatic means of adaptation". Technology was defined by objects and their use.
- In keeping with the later debates on style and function, technology was something apart, although as a focus for research it was used to determine the functional aspects of culture and a homeostatic relationship with nature. Techno-economic schema (e.g. Clark 1953, Figure 6) mitigated the influence of the environment, but also sought to explain changes in material culture. The objects were given a 'well defined' reality which amounted to no more than a evolutionary synthesis of rational rejoinders to environmental forces, instead of viewing those objects as the products of historically charged and fashioned social practices (Dobres 2000, 41-46).
- The bio-archaeological or economic approach developed from approaches instigated by Clark (1952; 1972), which focused on the socio-economic utilization of the environment. The ecological model determined that cultural rejoinders were considered to be adaptive to restrictive and specific ecological circumstances. The bio-cultural approach was mainly dealing with skeletal material to inform and supplement economic approaches from stable isotope analyses;
- The taphonomic processes at work to create the archaeological record (Schiffer 1972; 2002 [1976]).

Table 3-1: Synopsis of the development of theoretical approaches to technology.

3.2.3 Technology: introducing social theory

From Mithen's (1999) review of Mesolithic research, Young (2000a, 2) highlighted that our understanding of the social life, what he terms as lifeways, of the Mesolithic period is poor. It may be argued that this was because prehistoric technologies were not understood as being socially and symbolically imbued with meaning (Dobres 2000, 32). The introduction of social theory into archaeological research frameworks has attempted to correct this failing.

3.2.3.1 *Chaîne Opératoire*

Prehistoric technologies are now generally viewed as an inseparable quality of social life (Conneller 2008, 163). The origins of this stance may be traced back to Marcel Mauss who presented a paper to *La Sociètè de Psychologie* on 17th May 1934, which was published as *Les Techniques du corps* in 1936 (Tremblay 2008). Mauss (1936) considered that technology was a social fact with technological practice, as actions learnt by individual experience, bound within the social body (Schlanger 1994, 144; Conneller 2008, 163). *La suite des enchaînements* (Mauss 1936, 8), what would be later formalised as *enchaînements organiques* (Mauss 1947), was a structuring device to determine the correct and acceptable way to undertake tasks (Schlanger 1994, 144). Dobres (2000, 154) noted that the concept was fundamentally normative, and it did not acknowledge the potentiality of conflict. Leroi-Gourhan (1993 [1964]), who is responsible for coining the term *chaîne opératoire*, sought to analyse and describe the sequential and repetitive characteristics of the body's behaviour in undertaking technological tasks (Schlanger 1994, 144: Dobres 2000, 154). The programme for investigations and the analysis into prehistoric artefacts was grounded in science losing sight of Mauss' 'social fact', which resulted in the social dimension, identity and group identities, patterns of corporeal behaviour and the symbolism of technological practice being generally overlooked (Gosden 1994, 109; Dobres 2000, 154-155; Conneller 2008, 163). The *chaîne opératoire* has subsequently been incorporated within academic lines of enquiry into landscape and settlement and subsistence (cf. Sections 8.2.5.1 and 8.2.5.2).

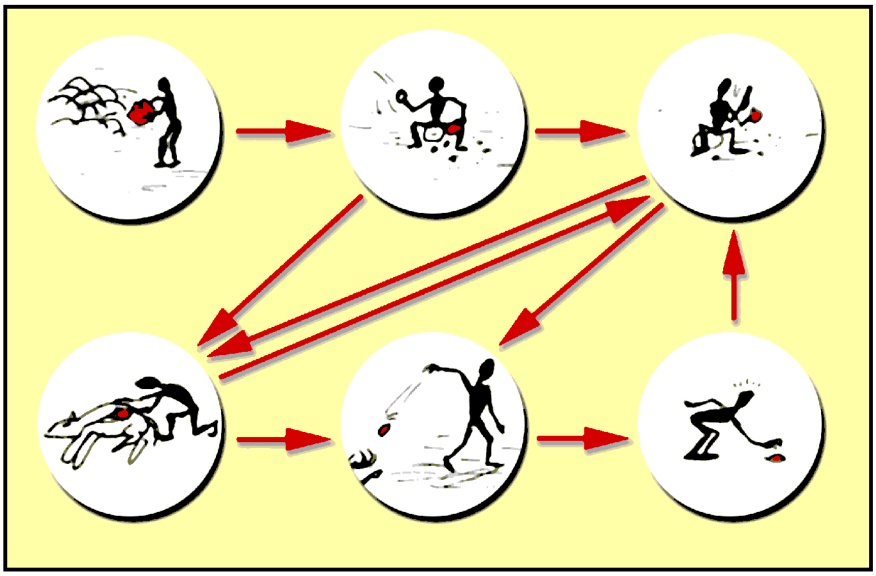

Figure 3.1: The *chaîne opératoire*. © Locutus Borg 2006. Image released into the public domain.

3.2.3.2 Agents, objects and performance

Dobres and Robb (2001a, 4) consider a brief history of the agency. Arguably, the most important aspects of agency for archaeological discourse may be found in the works of Bourdieu (1977 [1972]) and Giddens (1984). The latter considered the duality of structure, and determined that the structures in which people live are self-created, often as an unplanned corollary to their actions. Structure may be regarded as a recursive and dynamic constructive process developed by agents and intensities outwith their influence or control (Giddens 1984; Dobres and Robb 2001a, 5). Hodder (1987, 6) restated the notion that society was a dynamic forum in which agents may intentionally seek to change the structures in which they live. Bourdieu (1977 [1972], 73) argued that anthropologists by observing the daily routines of agents erroneously constructed explicit representations, and rules for the tasks undertaken. The term *habitus*, coined by Bourdieu (1977 [1972]), refers to practice as the manifestation of how things are done within the social dimension, and is not an explanation of practical knowledge. *Habitus* is an arena for the beliefs of people “beyond their conscious awareness or direct control” (Dobres and Robb 2001a, 5), mirroring the Deleuze’s second principle of ‘forget everything’ and the synthesis of reciprocal determination (cf. Sections 3.3.3.1 and 3.3.3.4). In the late 1970s research introduced agency into gender studies; gathering momentum in archaeology during the 1980s and 1990s (Gero 1983; Conkey and Spector 1984; Conkey and

Gero 1997; amongst others). The early 1990s saw agency featured in works by archaeologists such as Knapp (1992), who were inspired by the work of 20th century French historians of the *Annales* School; named after the journal *Annales d'histoire économique et sociale*. The commonality of approach centred on the premise that:

> "historical contexts of social and material interaction, along with non-discursive perceptions of the world, served as the proximate boundary conditions within which ancient peoples negotiated their world, while simultaneously creating and being constrained by it" (Dobres and Robb 2001a, 7).

Anthropology chiefly through the work of Gell (1994 [1992]; 1998) forced the academic community to consider whether or not things had agency. Gell (1994 [1992]) chose to define art not in aesthetic terms, but as the 'technology of enchantment', i.e. a component of technology which was crucial to how society was reproduced. Art is indexical (Gell 1998), which Tilley (1999) suggested was similar to things as a metaphor, although Gell preferred to see things as Peirceian icons or indexes, and all but rejected semiotics because of its associations with linguistics (Layton 2003, 447). Society was viewed as being comprised of agents as dynamic collectivities enchained within a network of intentionalities (Gell 1994 [1992]). Layton (2003) distinguishes Gell from Giddens who does not see agency as intentions but as the ability to act. An object is the embodiment of the magic of technology which reveals itself in an enchanted form; the enchantment of technology revealed through the technology of enchantment (Gell 1994 [1992]). This speaks to what Dobres (2001) would later understand as 'meaning in the making' (cf. Section 8.4.1). It is also possible to see the philosophy of Deleuze at play, i.e. the notion of 'becoming' rather than 'being'. For Gell (1994 [1992]), the social relation with the object is a conduit for influence and future social relations.

In *Art and Agency*, Gell (1998, 17) determines that agency is not restricted to human agents. Agency may be ascribed to things; the test concerns the ability of whether or not things can cause events to happen, which may or not be anticipated. These actions are outwith physical laws and can only be recognised as meaningful within the social dimension. Gell (1998, 222-223), embracing

Strathern (1988), proposes that an agent is a composite of the relations with others, what Thomas (2001, 5) describes as “the outcome of mediated practice”. The identity of the agent, referred to as inner personhood, is a replication of external forces. The external refers not only to other agents but also to distributed objects (Gell 1998, 222-223). D’Alleva (2001) notes that the potentiality for the symbolism of things has become enshrined in research frameworks, and criticises Gell for placing too much emphasis on the presented object which failed to recognise visual communication. Drawing upon ethnographic research in Tahiti she demonstrates that Gell’s notion of the captivating quality of things may be better understood if the symbolic elements of index are explored. Knappett (2002, 102-106) considers index as a concept to reframe the meaning of material culture.

Gell (1998, 18-19) determines that, in certain social settings, motor cars may be said to have agency. Miller (1994, 237) argues that the motor car in Trinidad speaks to self-image, although he concedes that it is possible for a thing to move from being regarded as a functional alienable object to become an inalienable object of devotion within social performance (Miller 1998, 8). It is arguable that in neither case does the thing have agency. The fact that a person may give a motor car a name and speak to it does not mean that it has agency. Shankar’s (2006) study of the South Asian American *Desi* communities of Silicon Valley in California demonstrated that it was not motor cars that had agency, but the objectification of practice, which involved motor cars, within a performance setting (cf. Section 8.4). Arguably, the best example of things having agency are the shell necklaces ‘*soulava*’ and shell armbands ‘*mwali*’ of the *Kula* gift exchange networks of the Trobriand Islands. Malinowski (1920; 1922) examines how the desire to obtain these items leads people to embark on voyages, and create political alliances between *Kula* partners. The pieces have complex biographies with great honour attached to the people who gift and those who can negotiate receipt of the most treasured items. Higher status lies with the giver as opposed to the recipient. A tradition of the status attached to giving, which is similar to the potlatch ceremonies of the First Nations in the north-west of the American continent (cf. Van Den Brink 1974).

Dobres and Robb (2001a, 7-8) note that during the last two decades of the 20th century there were four main themes developed in agency studies in archaeology. Firstly, that gender should feature in research agendas (cf. Section 3.3.4). Questions and enquiries were also made of the androcentric nature of archaeological practice. Secondly, agency was incorporated into studies to attempt to explain the significance of variation in material culture, with lines of academic enquiry evolving from the functional to the social, and extending the importance of context and structuration to the situatedness of the agent. Thirdly, agency was an inherent component of phenomenological approaches. Fourthly, the role agents may have played in the pursuit of status and the creation of power structures. Agency is difficult to define. Dobres and Robb (2001a, 9) highlight twelve different approaches in archaeology, some of which appear to be contradictory.

It may be argued that to define agency is reductionist. Agency as people, things or performance, has to be understood from the context of research.

3.2.3.3 Technology: style versus function

The focus on style versus function and style and agency during the 1980s and 1990s determined technology as 'a way of doing'. It was not until discourses into meaning within the social dimension that technology would be understood as 'a way of becoming'. A brief outline of these issues may be found at Table 3-2.

Technology: style versus function

- Conkey (1990) considered the structure and the qualities of the academic debate on style and function. Previously, Bailey (1983a) summarised the failings, in so far that the physical and cultural aspects of material culture are temporarily separated for academic enquiry in prehistoric contexts; suggesting that a greater emphasis was required for the technological and economic facets to enable archaeologists to build upon the paucity of perceptible patterns of the social dimension.
- Sackett (1982; 1990) sought to circumvent notions of style as passive by suggesting an approach termed isochrestic variation, which involved investigations of the different approaches in the manufacture and use of similar things. Social groups, in their most general sense, were identified by a distinctive material culture which represented a package of distinguishing blends of attributes, which is reminiscent of the attempt to define social boundaries from the attributes of microliths (Gendel 1984; 1987; 1989; Jacobi 1976; cf. Section 3.2.6.1). Isochrestic variation did not recognise role of the social dimension in the production and use of things (Sackett 1990; Dietler and Herbich 1998, 240, 263).

Technology: style and agency

- Dietler and Herbich (1998, 235-236), considered the meaning of material culture, and sought to distinguish 'things' from 'techniques'. The recursive relationship between things and the social dimension were considered to be understood by techniques, which was the process for the creation of style.
- The 'style of action', or '*techniques du* corps', is taken directly from Mauss (1936) and refers to the way actions are performed. 'Material style' is attribute patterning from the technological process of production (Dietler and Herbich 1998, 236). They do seek to distance themselves from the structuralism of Lévi-Strauss (1963), which is criticised for being fundamentally passive. Technique was distinguished from technology to facilitate an understanding of the complexity of the relationship between agency and technology. Where technique represented the embodiment of an agent's skill, and technology encompassed the embodiment of the operation sequence (Ingold 1993a; 1993b; 2000).
- Hegmon (1998, 269) summarised the relationship as "technique is to technology as agency is to structure". Technique as practice was directed by *habitus* (Bourdieu 1977 [1972]) and technology by reference to structuration theory (Giddens 1984), which assisted in understanding how practice influenced structure and potentially facilitated change in the social dimension.
- An over emphasis on technology reduced it to an object, where it was understood without reference to agency (Ingold 1993a). The concept of technology as an artefact was inherently evolutionary in nature (Clark 1953; White 1959; cf. Basalla 1998), an approach that was not sustainable as something outwith the social dimension (Ingold 1993b). This view as technology as an object did no more than reinforce the standard view of technology where it was considered to be in opposition to society (Ingold 1993b, 436). Ingold also viewed technology as 'extrasomatic', however, unlike Binford (1968) he did not lessen its importance to a device for strategies of adaptation.
- The social dimension was peopled by historically constituted agents, as opposed to adaptive cultural icons, where knowledge and social action were learned, and the operational sequences of technology may have provided markers to recognise group identities (Lemonnier 1986; 1989; Hegmon 1998, 268; Dietler and Herbich 1998, 245-248). This is introducing social theory into Sackett's (1982; 1990) isochrestic variation, where *habitus* is the forum for practice to reconcile structure and agency (Dietler and Herbich 1998, 245-248; Knapp and van Dommelen 2008, 23).
- The meaning of both 'style of action' and 'material style' is inherently bound within the concept of a 'way of doing' as opposed to a 'way of being', i.e. Deleuzian becoming.

Style: 'a way of doing' or 'a way of becoming'?

- Conkey (2006, 360, 366) advised against an overarching theory of style, which was often simply viewed as 'a way of doing'. This reductionist approach failed to recognise that style was a component of how the agent and social body made sense and brought meaning to their world. If style was considered to be a dynamic force of production then these cultural meanings were continually being negotiated and renegotiated within the social dimension. It was not only the objects that have style but also the technologies, material and the production process (Conkey 2006, 357).
- The importance in the production of cloth was considered in ethnographic and historical contexts where academics have interpreted the symbolism of cloth as:
  " a commodity, a critical object in social exchange, an objectification of ritual intent, a vehicle of symbolic meaning, and an instrument of political power" (Schneider and Weiner 1986, 178).
- The importance of Conkey's (2006) analysis is to demonstrate the multifaceted and interconnectedness of style, design and function, where style, dependent upon context, may be viewed as not only 'a way of doing', but also 'a way of being', which is reconfigured as a 'way of becoming' in Deleuzian terms. The importance of style is considered further below within the context of identity (cf. Section 3.2.6.2).

Table 3-2: Synopsis of the development of investigations into function, style and agency to show how technology as 'a way of doing' was reconfigured as 'a way of becoming'.

3.2.4 Technology and the meaning of things

Geertz's (2005 [1972]) ethnographic research in Bali determined that culture was a text that could be read. Buchli (1995, 182) noted that from the early 1980s this anthropological approach was incorporated into studies of material culture, and by association technology. Material culture was likened to a text from which a narrative could be constructed. This contextual archaeology incorporated the social dimension through the theories of practice and structuration (Parker Pearson 2000 [1982], 198; Shanks and Tilley (1987); Leone (1982); Hodder (1982; 1982a); amongst others). There were three main strands of contextual approaches. Firstly, Hodder (1986; with Hutson 2003) and Moore (1986 referenced in Buchli 1995) were the principal proponents for material culture as the product of social strategies manipulated by agents in the past. Secondly, the writings of Foucault and Marx were privileged to develop constructs to understand notions of power, supremacy and knowledge creation within social practice, and how those concepts replicated society; an approach exemplified by a number of authors (Shanks and Tilley 1987; Tilley 1989a; Miller and Tilley 1984a; amongst others). Thirdly, a Marxist approach based on Horkheimer's (1972) Critical Theory and the work of the sociologist Althusser (1984), which focused on material culture as a mediator to communication and ideology (Buchli 1995, 182).

Hodder (1991a; 1991b), influenced by Gadamer's (1976) concept of subjective prejudice, reconsidered the construction of contextual archaeology. This was, in the main, after a criticism that there was an inherent essentialist quality which led to problems in formulating historically constituted interpretations, and the difficulties in accommodating the postmodern notion of a multiplicity of interpretations (Knapp 1996, 137; Buchli 1995, 182). The Marxist perspectives were condemned for creating new structural functionalist meta-narratives steeped in the archaeological tradition of processualism (Barrett 1992; Bauman 1992; Buchli 1995, 183). Dietler and Herbich (1998, 239) noted that the structural semiotic approaches (e.g. Deetz 1977; Glassie 1975; Hodder 1982), either implicitly or explicitly incorporated Geertz's (2005 [1972]) concept of 'thick description', or 'deep play', which were considered to be synchronic in nature and unable to accommodate, either technology as a dynamic process, or explain changes, or innovations in style. Sahlins (1981, 6) criticised the introduction of structural semiotics in anthropology. Its focus on language obfuscated human action; an approach similar to Gell's (1998) rejection of theoretical constructs from linguistics. It has been further argued that contextual archaeology did not have the capacity to give meaning to the intricacies of the technological aspects of things and techniques within an analytical schema to examine the creation of style though practice (Dietler and Herbich 1998, 244).

Several other important theoretical approaches which were developed in Anthropology have had a significant impact on interpretive research frameworks in Archaeology. Appadurai (1986a) informed by the work of Mauss (2002 [1922]) and Simmel (1978 [1957]) determines that ‘things’ did not exist outwith the context of the social dimension where they are given meaning(s) through circulation. By recognising and ascribing a social life to ‘things’, it helps us to understand that they are inscribed, embodied and entangled through their social use and the pathways of their exchange. The human and social context in which ‘things’ were given meaning(s) is ascertained by understanding the trajectories of those items. This resonates with Latour’s (2005) Actor-Network Theory, which has been described as being inspired by Deleuzian rhizomatics (Jensen and Rödje 2010a, 2; cf. Section 3.3.3.3), where the network is a perspective in which the trajectory of things is inscribed and explained as a variation in their connection to other entities (Viveiros de Castro 2010, 223). The perspective may be likened to the social dimension; without it there is no repetition, no variation and no becoming (after Latour 2005, 115-116).

The tension between people and things in Anthropology has been recently highlighted (Henare *et al.* 2007a), where the validity of theoretical approaches to give meaning to material culture is questioned; suggesting that a methodological approach should be given prominence. Any theoretical research agenda is a forum for reflexivity as new data is uncovered. It could be argued that the adoption of an overarching methodology is not only reductionist but also synchronic. If it can be accepted that interpretation is a never ending dynamic process, it is diachronic in nature. This conflict does not occur in Archaeology because the resource represents material culture from the past. Kopytoff (1986) showed how pathways of exchange generate the biographies of things. Holtorf (1998) using the megaliths of Germany produced the seminal paper on the cultural biography of things.

The meaning of ‘things’ in Archaeology has been considered by a number of authors with different perspectives (e.g. Hodder 1989; 2004; 2011; Tilley 1989;

Shanks 1992; Bradley 2003 and others), and is central to this study (cf. Section 3.3.3).

It may be argued that the roots of Chapman's (2000) concept of fragmentation are contained in the writings of Appadurai (1986a), Kopytoff (1986) and Strathern (1988). The latter's ethnographic research in Melanesia determined that for certain cultures the person is produced by social relations and is, therefore, composed of them. This is in direct contrast to the Western notion of the pre-existence of the discrete agent before social relationships (*ibid*). The bridge between people and things is understood by the process of objectification (cf. Tilley 2006). If things are considered to immutable or inalienable they will be embodied with the characteristics of personhood. This suggests that things are reproduced; imbued with the values and significance of the person(s) who created them. The pathways of things create artefact biographies which speak to the enduring relationship between the people who used, possessed or controlled those objects. Enchainment is the embodiment of the social dimension, and refers to the seriatim of human interaction brought about by the exchange of things (Chapman 2000). Strathern's (1988) concept of the multiple person, i.e. the dividual, is used by Chapman (2000, 5) to illustrate the contextualisation of the conflict between personal individuality and dividuality amongst a complex web of enchainment. As fragments of things are re-aggregated social relationships are renewed. The notion of fragmentation or the divisible nature of things may be applied to people, objects, caches or hoards, skeletal material, personal and group identities and places in an encultured landscape (Chapman 2000). Finlay (2003b) explicitly developed the theme of 'multiple authorship' and the partible nature of things, in its extended sense, for Mesolithic studies.

3.2.5 Technology in the landscape

The late 1980s and 1990s witnessed the move away from site introspection with the development of landscape approaches to the variations in settlement practice, subsistence strategies and social organization. It could be termed as a strategy of enablement to further our understanding of routeways, vegetational impacts, and the related changes in behavioural activity. Heidegger's (1962

[1927]) phenomenology of 'being there' and the subsequent work by the French philosopher Merleau-Ponty (1962 [1945]) on the theory of the phenomenology of perception was initially adopted into Neolithic landscape studies by Tilley (1994; 1996) has also been incorporated into Mesolithic research (Young 2000a, 3).

A better understanding of the social dimension of the Mesolithic lived experience was considered achievable by contextualising sites within the landscape, and attempting to measure the human impact on the environment. It has been suggested that a greater emphasis should be afforded to interpretive theoretical constructs where the social dimension was inseparable from the functional and ecological (Cobb and Price 2005).

Cobb (2005) considers the dominant research agendas into the Mesolithic of western Scotland using Saville's (2004) edited volume entitled *Mesolithic Scotland and its Neighbours* as the template. A number of the contributors are criticised for theoretical bases steeped in empirical, positivist and objective methodologies. The interpretations are fundamentally situated in a refuge of objectivity based on the quantitative and empirical analyses of data. An approach rationalised by the ephemeral nature and the bias of preservation of the archaeological record (Cobb 2005). Shanks and Tilley (1987) proposed that a methodology founded on objectivity which was free of bias was a fallacy of processual approaches. To persist with these unsustainable reductionist lines of enquiry is to effectively obfuscate an attempt to understand how people during the Mesolithic period experienced and made sense of their world (Cobb 2005).

Conneller (2000, 2) makes the point that it has proved difficult to move research into the Mesolithic period away from a principal focus on ecology and economic strategies. The integrated approach highlighted by Cobb and Price (2005) are evident in papers from Conneller (2000), Bevan and Moore (2003), Cobb *et al.* (2005), Milner and Woodman (2005) and Conneller and Warren (2006). Finlay (2006, 44) points out that the edited volume *Peopling the Mesolithic in a Northern Environment* (Bevan and Moore 2003) does not consider the social relationships between people, but concentrates on how people relate to their world, and seeks to ascertain if ritual and cosmology can be inferred from the archaeological record. Conneller (2004) reviewed the contributions to *Mesolithic on the Move* (Larsson *et al.* 2003), and noted that whilst some of the papers remain immersed in functional and structural functionalist perspectives, there was encouraging evidence for fresh theoretical approaches. The principal and recurrent themes are the use of ethnographic analogy, ethnicity, stable isotope analysis and a diversity of methodologies for the interpretation of lithic material.

The criticisms made by Conneller (2000; 2004) can be levelled at many of the contributions to *Mesolithic Horizons* (McCartan *et al*. 2009) and *Chronology and Evolution within the Mesolithic of North-West Europe* (Crombé *et al*. 2009). The title of the latter volume goes some way to explaining any such criticism. A common feature to both volumes is the pan-European focus given to Mesolithic: Neolithic transition. The editors of *Mesolithic Horizons* (McCartan *et al*. 2009a, xvii) make the point that themes largely replicate those featured in *Mesolithic on the Move* (Larsson *et al*. 2003), except for papers relating to the utilisation of raw materials, predominantly quartz, other than flint (e.g. Rankama 2009; Eigeland 2009; Falkenström 2009). The contributions to the theme of 'Understanding Mesolithic Technology' are generally functionalist in their approaches, apart from Costa and Sternke (2009) who explore raw material choice as representative of the outcome of socially negotiated solutions to habitat limitations.

The evidence for innovative theoretical constructs, other than cognitive approaches, to interpretation is unfortunately difficult to find in the volume *Mesolithic Europe* (Bailey and Spikins 2008). The book covers Mesolithic research in Europe with each chapter focusing on a particular macroregion, thereby permitting inter-regional comparison (Boyle 2009). Spikins (2008, 6) advises that the diversity and variability of the Mesolithic is a key theme. The traditional functional themes of subsistence strategies, adaptations to the environment and ecology permeate throughout the various chapters. The diversity of the Mesolithic is also represented in mainly functionalist terms. Spikins (2008) makes the point that ecological and environmental models cannot be set aside, which in itself is true, although in reality they can only provide the backdrop for interpretive frameworks.

Cognitive approaches, which may be viewed as complementary to interpretive frameworks, consider how the environmental impact of the transgressions and regressions of the Holocene sea may have altered hunter-gatherer perceptions of their world was understood (Dolukhanov 2008; Bjerck 2008; Blankholm 2008). A similar theme is evident from the landscape perspective. The changing face of the landscape from tundra scrub to woodland, and the development of the woodland environment with the encroachment of new species are considered in terms of the impact on hunting strategies and mammal populations (Pluciennik 2008; Tolan-Smith 2008; Jochim 2008). The colonisation of unoccupied habitats is explored in a number of papers. It is suggested that new technological advances and innovations were required as part of the adaptive process to the occupation of these new territories (Bjerck 2008; Tolan-Smith 2008; Valdeyron 2008; Pluciennik 2008; Svoboda 2008).

3.2.5.1 Technology: settlement and subsistence perspectives

Spikins (2000) criticises models for settlement patterns which have been based on seasonality, subsistence and the creation of functional hierarchies; echoed in critiques of landscape approaches, e.g. Conneller (2005). Spikins (2000) adopts a contextual approach and questions the validity of ethnographic analogy to create ‘truisms’ to understand and interpret settlement patterns during the Mesolithic period. Bevan (2003) uses ethnographic studies to show that hunting cannot be viewed simply as an economic activity. Performance may be associated with human and animal fertility, personhood and taboos. For the Canadian Cree, the hunted animal must give itself to the hunter to avoid the pollution of murder (Feit 1995). The antler frontlets from Star Carr are interpreted as masks for rituals associated with hunting. The settlement site becomes a place where performance is expressed as part of a wider social and cosmological trajectory across the landscape (e.g. Conneller 2004a); perhaps incorporating the formation of exogamous relationships between males and females from hunter-gatherer groups (Bevan 2003).

An alternate, although complementary, approach is offered by Finlay (2003a) to consider the narratives of the Mesolithic experience on its own merits. Using the idiosyncratic Late Mesolithic of Ireland as a case study, she explores how a nuanced approach to interpretation can be undertaken by stripping away the constraints imposed by general technological categories for settlement and subsistence strategies, and seeking out alternate criteria. Unlike the situation in

Scotland, caches of lithic material occur during the Mesolithic. Rather than simply regarding these items as curated technological material, Finlay (2003a, 91-92) noted that the lithic caches comprised of three pieces or multiples thereof, a pattern which is not replicated during the Neolithic in Ireland (Woodman 1992). It is not possible to determine whether or not there is a symbolic or ritual significance to these caches. Sites are often interpreted as components of a broader meta-narrative disregarding the possibility of the perception of the human experience at a given moment. Finlay (2003a, 93) provides an evocative narrative of the lived experience of the people who occupied Ferriter's Cove, and explicitly informs us of the importance of such snapshots of the moment are worthy of academic enquiry. The lithic as a moment of becoming within the *chaîne opératoire* is an integral feature of the potential for the recognition of identity and group identities (cf. Section 8.5).

The nature of complexity was examined by Price and Brown (1985) to refer to exchange networks, sedentism, food and other storage strategies, social hierarchies, and burials (Spikins 1999, 72). The reasons for the development of site complexity are considered by Nash (2003) using the evidence from the Late Mesolithic period in Denmark. Settlement sites are principally found in estuarine, riverine and coastal locations. The hinterland provided the seasonal resources of deer, freshwater fish and hazelnuts. Faunal and floral evidence from the Ertebølle shell middens attest to these subsistence strategies. These sedentary sites are in marked contrast to the temporary inland camps favoured during the preceding *Maglemosian*. This shift involved increases in site occupation areas, the harvesting of additional marine species and evidence revealing an intensification of the utilisation of faunal and floral resources, and the adoption of different technological approaches for flint working. Social complexity was determined to equate with a rise in populations, which was suggested by an increased requirement for food based on the diversification of animal species required for subsistence strategies. The notion of social complexity may have arisen because of the focus on ecological and economic approaches in Mesolithic research (Spikins 1999). Moore (2003) suggests that it has also been inferred by the presence of burials and monuments as indicators of sedentism. The capacity of hunter-gatherer groups to adapt to environmental change, and bury their dead in particular locations cannot be regarded as an indicator of sedentism (Gardiner 2003).

Warren (2005a) criticises the use of the concept of 'social complexity'. Other hunter-gatherer groups are defined in negative opposition. Complexity is based on the principal of social evolution, and masks the diversity of the human experience during the Mesolithic period, and demeans the social dimension of hunter-gatherers who may not embark upon sedentary occupations. The nature of our knowledge of the Mesolithic should promote the quest for narratives of hunter-gatherers in a world of meanings, and not just those based on an evolutionary typology. For my own part, the use of the word 'complexity' should be confined to studies dealing with the historicity of Mesolithic research. Difference should not be confused with 'complexity'. For example, it is inconceivable that Mesolithic lifeways in West Central Scotland were less 'complex' than the Ertebølle of Denmark.

Finlayson (2006, 182-184) indicates that a more nuanced approach is required to understand the dialectic between sedentary occupations and mobility, not only as points on a continuum but also appreciated as a vehicle to realise how hunter-gatherers perceived their world. One group may have retained a sense of abstract sedentism as they were moving across the landscape. Jordan (2006) refers to the tent as the epicentre of a social territory, and as a metaphor for social stability. The world of the hunter-gatherer communities should not be broken into concepts of stasis and mobility, e.g. a hunter-gatherer group may see mobility as an opportunity to remodel their world as they move through it (see also Grøn 2003). In this way the association between complexity and sedentism becomes unsustainable. The continuum provides the framework for change or the possibility for change of structures, the physical and the social, where the instrument for variation is forged from the unerring process of fragmentation and recreation in becoming.

Milner (2005) explores how the consumption of food should be regarded as multifaceted. It offers insights into aspects of performance and social behaviour, and should not only be considered in economic, calorific content and environmental terms. These factors should not be regarded as mutually exclusive, but form a weave from which to formulate questions of the practice relating to consumption. Subsistence in the Mesolithic period has often been defined in opposition to Neolithic farming communities (Milner 2006). Regardless of the doubtful efficacy of such a dualism, the perceived differences are becoming more blurred with the discovery of early types of cereal pollens in Mesolithic contexts in England and the Isle of Man (Blackford *et al.* 2008; cf. Section 2.5.2). Food can be viewed as material culture within the social dimension. The economic data must be integrated with ideas of technology, landscape and ethnographic analogy. It is suggested that to achieve an insight into the lived experience, utilising the *chaîne opératoire* as part of the research agenda may assist in phrasing questions regarding social, ritual and symbolic characteristics of food procurement, preparation, consumption and disposal (Milner 2006).

The adoption of competitive feasting practice, e.g. the potlatch of the *Haida* of the Queen Charlotte Islands archipelago off the west coast of Canada (Van Den Brink 1974) may have necessitated a transformation in social practice (Bender 1978; Hayden 1990). Milner (2006) considers the contribution of Wright's (2000) research into the Early Neolithic villages in the Near East where it is suggested that alterations in the preparation and consumption of food reflected the re-assignment of gendered tasks. Behavioural traits may be gleaned from the intentional disposition of waste, which could also reveal variations in diet and procurement as well as signify social organisation, sedentary occupations and feasting. An integrated methodology may indicate the social intricacies of the *chaîne opératoire*, and avoid the simplifications of dualistic stereotypes based on geographic locations and gender associations (Milner 2006).

3.2.5.2 Technology: landscape perspectives

The hunter-gatherer groups occupied a landscape permeated with meanings, myths and metaphor where water, natural places, plants and animals are interwoven into the human experience of becoming. Persistent places cannot be reduced to economic subsistence strategies but may speak to a broader cosmological significance (Cummings 2003). A persistent place has been interpreted as a location for a particular behavioural mode sustained from repeated visits over time (Schlanger 1992; Barton *et al.* 1995, 109). Jordan (2006) suggests that the ritual and symbolic exploitation of place cannot be defined in opposition to the functional. Ethnographic analogy informs us how hunter-gatherer activity is associated with natural places through an affinity and empathy with animals, which reiterates Cummings' point, that the procurement of food requires a more nuanced interpretation than subsistence. The processes relating to the intentional placing of artefacts and animal remains encultures the landscape and conveys insights into the relationship between the physical and metaphysical.

The Mesolithic landscape, including natural places (Bradley 2000), cannot be understood purely in terms of knowledge or perception; meaningful or significant places are constructed, and are integral to identity and group identities. This process of creating 'architectural space' is dynamic and fashioned in both temporal and spatial scales by the negotiation and re-negotiation of the relationships not only of people but also of people to things. Warren (2000) building on the work of Pollard (1996) where the shore is an active liminal place where space is constructed to the accompaniment of the rhythms of the sea. He attempts to seek out how knowledge is gained, and how that may have empowered hunter-gatherer groups and may have been a factor in conceiving a group identity.

Cummings (2000) in an earlier paper seeks to establish how the world view of the Mesolithic people of Pembrokeshire in Wales may have been influenced by the landscape. The embodied form of the landscape has been described as a taskscape by Ingold (2000, 194-200); the tasks undertaken by people in the landscape create place out of space (Tilley 1994; Low and Lawrence-Zuniga 2003). The hunter-gatherer groups who occupied the coastal margins of West Wales would have been attracted to those areas as a suitable habitat from which to exploit food resources (Cummings 2003), a situation similar to the coastal environments of Ballantrae and Girvan (cf. Section 2.5.1). However, the importance of myth and metaphor which may have permeated the landscape must be considered, and how the human senses may have motivated both personal and group memory for the seriatim of occupations of certain locations through time (*ibid*). Drawing upon ethnographic analogy and a number of case studies from west Scotland and West Wales, Cummings (2003) suggests that the re-use of these locations as part of an economic strategy were bound within the cosmological significance of water, natural topographic features, plants and animals.

Jordan (2003) expands upon this theme of the enculturation of the landscape. The reverence and transformation of locations are understood by the creation and use of place, including the deposition of material culture. Regardless of the difficulty in recognising these archaeological signatures it is incumbent upon the archaeologist to consider the possibility of their existence. The cosmological significance of material culture is not confined to the sacred, but is present in its material manifestation and the renegotiation of the world view of hunter-gatherer groups. The bond that exists between the biographies of material culture and the encultured landscape sets the framework to consider questions of gender, kinship and tenure. These issues are echoed by Cobb (2005) in what she describes as the ideological interconnections of people, material culture, use and re-use of persistent places. Chatterton (2003) explores belief structures which are tied into rituals of consumption and deposition using ethnographic studies of the *Saami* of Northern Scandinavia and the *Cree* of Canada. The notions of personhood and animism reveal a cosmological bond between humans, animals and the forces of nature (Feit 1995). Performance establishes the link between the physical world and the metaphysical. The seashores, lochsides and the banks of rivers are considered to be the liminal zones as locations of access to the spirit world. The dry land represents the physical in opposition to the metaphysicality of water (Chatterton 2003).

The archaeologist should move away from the traditional site focused approach and seek to understand sites as part of a wider regional landscape. The relationship to other areas may be understood by the tasks, material culture and knowledge of other agents (Conneller 2003). This approach must involve the deconstruction of the reductionist methodologies of site typologies based on economic notions, and the academic fiction of the perpetual and ahistorical seasonal round (cf. Section 3.2.6.1). The traditional approaches tend to generate ideas of reducing temporal and spatial scales, and masking the investigation of continuity and variations in assemblages arising out of a seriatim of occupations. A series of refitment studies provide a suitable analogy for the drawing together of the diachronic movement of people and the tasks undertaken by them across the landscape (Conneller and Schadla-Hall 2003;

Conneller 2005; Warren 2006). A focus on 'persistent places' may encourage the creation of a new hierarchical site typology, and draw away investigation into places where the material traces left by hunter-gatherer groups are more ephemeral (McFadyen 2006). McFadyen (2006, 134) considers this diachronic functional stasis undermines the complexity and fluidity of the use of place during the Mesolithic period. To exemplify this notion of 'mobile space', space should be viewed as active which serves as a conduit to other spaces. It does not order or control practice but complements it (Grosz 2001; referenced in McFadyen 2006, 135). This concept can be understood in Conneller's (2000a) ideas of technological practice as a constructive event (McFadyen 2006, 135). Finlay (2000; 2000a) explores how the body moves through space while engaged in the manufacture of microliths. Certain tasks may have been shared, thereby amplifying the cross-cutting relationships between people and objects into additional activities (McFadyen 2006). The concept of mobile space can be read into Warren's (2000) fashioning of a seascape imbued with meaning. The sea is interpreted as a highway integral, e.g. which is deemed to be crucial to the dispersal and the fluidity associated with the working of bloodstone from Rùm (McFadyen 2006).

For the greater part of the Mesolithic period hunter-gatherer groups were occupying an encultured forested environment. McFadyen (2006) asks the reader to consider the forest as a physical and metaphysical architectural space. People during the Mesolithic period would have moved in and out of the forest and we enter and exit buildings today. Where we reduce buildings to function and create hierarchies through ownership, differential access and religious significance; these dualisms must not read into our interpretations of how hunter-gatherer group may have understood their world. Price (2005) considers the social life of trees during the Mesolithic period in southern Scandinavia. It is suggested that different species may have had symbolic meanings; resulting in certain trees being used for canoes and others for bows, and thereby potentially providing evidence for the expression of social strategies.

Pannett (2007) draws upon the concepts of the encultured landscape and the social inferences that can be understood from the Mesolithic components of lithic scatters representing mixed period palimpsests from Olicett in Caithness. The assemblages reveal the physical manifestation of enculturation (Zvelebil

2003; Jordan 2003), although they must be understood in a wider social setting (Finlay 2000a). The occupations favoured settlement in the vicinity of water courses and lochs where an array of tasks were embarked upon. It was noted that microburins and microliths were absent from these assemblages. The evidence for the manufacture of microliths was discovered on a mound apart from, but in the vicinity of the settlement area. It is proposed that the tasks involved in the production of microliths required a location outwith the domestic sphere of activity suggesting a locale imbued with a social and cultural significance different to the settlement area. The author makes the point that without any absolute dating evidence the interpretation is based on the assumption that the sites are contemporaneous (Pannett 2007).

McFadyen (2008), referencing Edmonds (1997) examines the importance of technology and technological practice in the landscape, where the lithic scatters, described as the material remains of past actions, of the Mesolithic period were being actively maintained. This approach by McFadyen augmented by Pannett's analysis has a quality, which appears to be analogous to Dobres' (2001) ideas of technology as 'meaning in the making', that it is technology within the social dimension that creates meaning in the landscape.

Conneller (2000a) incorporates the *chaîne opératoire* within landscape studies. The notion of the taskscape proposed by Ingold (2000 [1993]) characterizes a landscape in process that is embodied, diachronic and perpetually in a state of negotiation. The mutuality of the landscape should not be viewed as a composite of task areas, i.e. fragmented, but as a grey scale of central places without arbitrarily constructed boundaries. The taskscape deconstructs the distinction between hunter-gatherers communities and the environment (Conneller 2000a, 146). The concept of the taskscape is extended to include rhizomatics from the philosophies of Deleuze and Guattari (2004 [1972]), where tasks, subject and object are interwoven by process. The subject and object are a seriatim of fragmented things, associations, change, continuations and interruptions. The partible nature of things, people and the environment are part of a continuing series of processes of becoming through connections and disconnections. The diachronic character of the taskscape can be applied to the *chaîne opératoire* where the various stages of the conceptual scheme blur into each other, and the cadence of the reduction process is interrupted by either the knapper, or because of the relationship to the tasks undertaken by others (Conneller 2000a, 146-147).

Conneller's (2000a; 2003) vision of a meaningful taskscape, incorporating the *chaîne opératoire*, of connections and disconnections allows it to be understood as becoming. This becoming taskscape is imbued with cosmological significance, including myth, metaphor and personhood as the conduit between the physical and the meta-physical (after Cummings 2003; after Jordan 2003; after Chatterton 2003 and after McFadyen 2006). Pannett's (2007) analysis asks us to consider the possibility of disconnections between settlement and certain tasks. This may be particularly relevant to inland events where broadly contemporaneous events may be represented by a suite of different sites, suggesting variations in the cultural meaning of taskscapes.

3.2.6 Technology and identity

3.2.6.1 Technology: social boundaries

Firstly, this section explores academic perspectives into how technology, within the social dimension, has been used to offer interpretations for the demarcation of social boundaries. Secondly, it provides the background for a discussion in chapter 8 to determine if, and to what extent social boundaries in West Central Scotland can be ascertained from the technological analysis of the lithic assemblages.

The approach formulated by Dietler and Herbich (1998) develops Stark's (1998a) ideas on how technological choices can be used to give meaning, and provide an understanding of social boundaries. Where Stark views social boundaries as discernible social facts, or what the critical or sceptical postmodernist may describe as 'true knowledge' (Rosenau 1992, 15). Dietler and Herbich recognise that it is not always possible to distinguish social boundaries through the analysis of technology (Hegmon 1998, 271). Their approach was influenced by the French concept of *technologie* as adapted to include Bourdieu's (1977 [1972]) theory of practice. Practice is said to be the dynamic bridge between material culture and its conceptualisation. The *chaîne opératoire* highlights how things are produced and consumed. Each component of the *chaîne opératoire* requires choices and techniques to be objectified, and it is that process which leads to an understanding of the reciprocal nature and interconnectedness of choices made.

Hegmon (1998) contrasts the difference between the Dietler and Herbich approach to the research criteria of Goodby (1998) and MacEachern (1998), where social boundaries should be considered in abstract because, on the basis of perceptions of identity and different social contexts, different people or groups may for a variety of motives may give alternate meanings to social boundaries (Goodby 1998, 161; Walsh 1990, 280; Knapp 1996, 137). Drawing evidence from ethnographic accounts focusing on ethnicity, Hegmon (1998, 272-273) attempts to ascertain how it may be possible for archaeologists to recognise social boundaries in the past. MacEachern (1998) saw an accord in the work of a number of anthropologists but privileges two themes developed by Barth (1998a [1969]). Firstly, the structure of boundaries was favoured, where they were revealed by variation of some sort; indicated by the difference in material culture within and outwith. Secondly, boundaries were not seen as social facts, but as social constructs (Hegmon 1998 271-272) emphasising the complexity between ethnically constructed boundaries and the patterning or common traits of material culture. Boundaries were characteristic of the social interactions of members of communities, and were noted by the significance of the relational and symbolism of things rather than simply objectifying difference (Barth 1998a [1969]). Hegmon (1998, 272) recognises an agreement, by reference to numerous anthropological authors, in defining ethnicity as “something that people do” as opposed to being an inherent existential quality.

An understanding of the spatial and temporal technological differences in material culture may act as a potential identifier of social boundaries must incorporate social theory, and in particular the dynamism of structuration and practice. This does not imply that the archaeologist will always be able to determine boundaries to the social dimension. The potentiality of multiple meanings imbued within the technological aspects of material culture exposes the difficulty in defining social boundaries (Hegmon 1998). For example, ethnographic analogy reveals that material culture as technology may not only identify social boundaries but may also indicate status, gender and age (Lemonnier 1986), or language and ethnicity, or self-expression rather than group identity (Hegmon 1998). In contrast, technology may cross-cut communities and, therefore, may be unsuitable as an identifier of social boundaries (Croes 1989; Goodby 1998), which is particularly relevant where in West Central Scotland there is an intra-regional continuity of technical practice (cf. Sections 8.4, 8.5 and 8.6.4).

The modern western notion of social boundaries at a variety of scales is one of areas of political enclosure, e.g. nation states, local authorities, cities, towns, villages or fragmented areas within conurbations created by what Trudeau (2006) describes as modern orthodoxies. Brody's (2002 [1981]) work in the north-west of British Columbia among the first nations indicates that social boundaries may consist of routeways and riverways across the landscape as communities move from area to another. However, social boundaries as linear trajectories give the impression that the greater part of the landscape is empty, although McFadyen (2008) does ask if during the Mesolithic period sites should be understood as points along a route? The 'enclosure' element will refer to settlements, hunting grounds, and foraging activities. The multifaceted nature of the social boundaries of hunter-gatherer-fisher groups is elegantly portrayed in maps drawn by the people of the First Nations of British Columbia (Brody 2002, 154-173). Thom (2009) argues that social boundaries cannot be simply considered on the basis of utilisation. Broader themes such as the connections between people and place, residence, language and identity must be factored into any understanding of the demarcation of territories. Hasson (1996) argues that place is strongly linked to symbolism and emotional identity. The representation of social boundaries whether terrestrial or marine is unstable and, therefore, permeable; territories may be recognised and defined by different groups in different ways and may be associated with notions of kin, travel, descent and sharing (Hasson 1996; Thom 2009). Lines encircling areas on the map create First Nation orthodoxies which are required for the political fight for the right to territory (Thom 2009). Trudeau (2006) defines the landscape as *doxa,* which highlights the expansion of term used by Bourdieu (1977 [1972], 164-171), where boundaries are set by meaning and practice in the social dimension (cf. Section 3.3.3.3). In the past, the social boundaries in the taskscape, which in this case includes both land and sea, for a hunter-gatherer-fisher group may have been a series of greyscales interlocking and overlapping with other groups.

A continuity of technological practice may make the concept of social boundaries based on the technical attributes of material culture redundant as a line of academic enquiry for Mesolithic studies in West Central Scotland (after Hegmon 1998; after Croes 1989; and Goodby 1998). Due to the introduction of the *chaîne opératoire* into landscape approaches (Conneller (2000a; 2003) which may increase the possibility of being able to tentatively offer some insight into the attribution of social boundaries (cf. Section 8.6.4.1).

3.2.6.2 Technology and identity: archaeological perspectives

Western rationality objectifies and defines the human experience in opposition to material culture (after Brück 1999). An identity centred on "*what* they make, *how* they make, how they *use*, and the degree to which they *control* the natural world through material means" (Dobres 2000, 33; original emphases).

Wobst (1977, 328-330 referenced in Dietler and Herbich 1998, 241) determined that style was a symbolic device to broadcast social boundaries and identity to other communities. This approach was considered to be too narrow for a generalised schema, based on a greyscale of the visibility of things, for effectively communicating concepts of group identity. Hegmon (1998, 267) takes a different view and argues that Sackett (1982; 1990), and presumably Wobst, may be suggesting that technology can produce style which may be, in specific contexts, an indicator of social boundaries and, thereby identity. A point echoed by Conkey (2006) in respect of identity.

The notion of technology and style as material culture as a communicator of group identities was developed to include ideas of power structures within the social dimension, and the role of things for manipulating ideologies (Hegmon 1998; Conkey 2006). The work of the anthropologist Daniel Miller (1985; 1987) was prominent in this regard; building into his ethnographic accounts Bourdieu's (1977 [1972]) theory of practice (Dietler and Herbich 1998, 243). This allows style to be considered as an identity marker in terms of 'a way of doing' and as 'a way of being' (Conkey 2006).

The component pieces within a lithic assemblage are distinguished by typology rather than style which imply a universal utilitarian function (Dietler and

Herbich 1998, 237). This narrow view hides the technical choices and functional use of things, which are conditioned by social and cultural factors as demonstrated by Finlayson's (198; 1990; 1990a) use-wear analysis of the microliths from the Mesolithic sites of Starr and Smittons. An integrated research agenda, which incorporates facets of technology, common differences and variation, is required because each stage of the *chaîne opératoire* comprises of interconnected operational choices imbued with symbolism, social aspects and cultural concepts (Lemonnier 1986; 1990; Dietler and Herbich 1998, 238). The study of technology is not about the formulation of descriptors of the minutiae of prehistoric activities but "to understand microscale social processes" (Dobres and Hoffman 1994, 213). It is from the microscale social processes that it may be possible to recognise group identity.

The traditional wisdom of microliths as armatures for projectiles used by males for hunting; the stereotype of "boys and arrows", is questioned by Finlay (2000, 68). The approach incorporates the *chaîne opératoire*, and discusses the behavioural inferences that be drawn from the production of the blank, the use of the microburin technique and the retouch applied to the piece. Experimental replication is undertaken to inform and aid the interpretation of the archaeological record. Use-wear analysis indicates that microliths had other non-hunting functions, and thereby emasculating the androcentric gender stereotype associated with those pieces, and consider narratives for the roles of women and children. Enquiry into the social dimensions of technologies permits the archaeologist to investigate the nature and transmission of skill, and the context of production (Finlay 2000a). This theme was further developed by Finlay (2003b) using the concept of multiple authorship in conjunction with the *chaîne opératoire*. Multiple authorship defines how people, events and things can be fragmented, and considers how it may be used to provide insight into the social dimension of lithic technology. This integrated approach may stimulate an awareness of the significance of microlith biographies in the forming of identity, and to give a greater resonance and insight to questions of gender, age and social relations. The manufacture of microliths has been generally interpreted as the product of a single agent. Finlay (2003b, 175) explores the significance of multiple microliths as components to a hafted tool. They may be regarded as the embodiment of communal force, and the forum for the manifestation of the group dynamic. Darvill (2003) discusses the focus and scale of analysis suggesting the importance of community and social action over the behavioural traits of agents. When the microlith is hafted the greater part, if not all of the secondary modification to the blank is hidden. Following Gell (1994 [1992]), Finlay (2003b, 175) determines that the symbolism of the hidden may have greater significance to what is seen. If that is the case, then context may be the key to taking this understanding further. If the microlith embodies a group identity, and it is discarded at a knapping location; does this act advertise to other hunter-gatherers groups the physical significance and claims to place? The microlith becomes epistemological, imbued with knowledge. The question is, therefore, does the mutuality of access (after Layton and O'Hara 2010) refer to other kin groups and potentially barring unrelated groups? In contrast, the hafted microliths may speak to the metaphysical aspects of group identity. Mithen (1999, 54-55) suggests that the reason for the diversity of microliths forms is not understood. The various microlith types may inform us about behavioural units, social groups, possible trading and exchange patterns and the social use of space at sites. The problems associated with the stylistic variation in microliths and the assignment of personal and group identities are considered at Section 8.6.4.1.

Identity incorporates themes including difference and variation, embodiment, agency and subjectivity, amongst others. It may be described as both dynamic and multifaceted and defined differently by discrete agents depending upon the context of engagement, where notions of age, gender, ethnicity, social grouping or sex may be at play (Meskell and Preucel 2004a, 124-125). Identity may be said to be constructed in practice by the social body (Strathern 1988 and others), and it is things that define the agent as part of a social group (Hoskins 1998; Gosden and Marshall 1999a), and defined as:

> "a concept of individuals as a negotiation between differing social and personal concerns .... [as part of and inseparable from] a materially constructed world, one that generates but equally constrains (consciously or unconsciously) social experiences of social actors" (Knapp and van Dommelen 2008, 22).

Knapp and van Dommelen (2008) favour an approach based on practice which is in marked contrast to Thomas (e.g. 2002; 2008), whose understanding of identity is forged by Foucault (1998 [1976]) and the analysis of relationship of power within structures. The concept of supervenience from analytical philosophy determines that where there are two or more entities the composition of one entity cannot vary without variation in the other. One entity supervenes on the other (after Kim 1990). The agent is restricted by social structure, but reconfigures and replicates social structure through practice (Dietler and Herbich 1998, 245-248; Knapp and van Dommelen 2008, 23). This may be said to be illustrated in psychology. For example, the social dimension is where identity is activated and social objectives are achieved. The agent's roles in society are continually renegotiated within the social body. Membership of the social group is a form of self-verification or self-awareness; that is having roles within the social body. Self-verification speaks to normative behavioural practice. The person's agency is enhanced by being a member of the social body, which in turn is enhanced by the agent's membership. These normative ties bind the social body (Burke and Stets 1999; Stets and Burke 2000). The levelling mechanisms to avoid conflict and the permeable and fluid nature of hunter-gatherer groups are considered at Section 8.5.

The social network of hunter-gatherer groups would derive from the interaction of agents as they went about their various tasks within the landscape. The recovery of lithic assemblages signifies a connection to these groups through the raw material and the indivisible quality of the social, technological and symbolic manifestation of their actions in creating identity and group identities (Conneller 2003). Gamble (2007) uses enchainment and fragmentation to construct and understand past identities.

An interesting notion to come out of Edmonds (1997), Pannett (2007) and Finlay (2003a; see above) is the potential for a more nuanced understanding of lithic scatters as the embodiment of past actions. The discard of worked stone may indicate the 'social death' of those pieces. They remain in the social sphere of being and experience, but may represent their becoming as identifiers to the ancestral or metaphysical aspects of group identities, and reaffirming claims to place (cf. Section 8.6.2). The picking up of a discarded artefact to rework would reinvigorate that piece within the living social dimension and may be regarded as presencing the ancestors. It is not possible to lay claim that all lithics scatters are, therefore, ancestral in composition. A supposition that would deny the possibility of conflict, where different communities may have taken over another group's claims to raw materials and place.

3.3 Variation

There are four specific sections in this part of the chapter which centre on the theme of the creation of variation through repetition and becoming in the social dimension.

- 'Introducing Variation' considers some of the manifestations of variation in the archaeological record.

- Using the work of Deleuze, it searches for a way to introduce a theoretical setting to offer the potential to understand the process that produces variation, and its importance to notions of identity.

- Deleuzian philosophy seeks to demonstrate that variation or difference derives from repetition through an embodied technology within the social dimension, and also considers relevant aspects of agency and structuration.

- A review of gender studies as a case study reveals how the social body constructs variation or difference as becoming through repetition.

3.3.1 Introducing variation

Variation can refer to, and be considered in terms of all aspects of Mesolithic lifeways, including the disparate choices made across the landscape by a hunter-gatherer group in settlement locations, economic strategies and at each stage of the *chaîne opératoire* from the procurement of raw materials to the discard of debitage and modified artefacts.

The lithic assemblage will stimulate responses and understandings, which because of difference and variation, may be quite distinct from other groups. It is possible to perceive how the archaeologist may seek to establish the identity of hunter-gatherer groups at a micro-scale and possibly trace their identifiers across the landscape.

Recent research has demonstrated that the identifier cannot be reduced solely to the morphology of the lithics but must also take into account the technological attributes of the artefacts (Lindgren 2003; Larsson 2007; Reynier 2000). Straus (2008, 216) describes type sites and type fossils as the "lowest level of heuristic simplification". Manifestations of variation may be due to taphonomic processes, or evident as palimpsests. The social dimension when considered as a group dynamic may also reveal variations associated with age, gender, task differentiation and sharing, and identity (Gosden 1999: Finlay 2003b; 2006).

The choice or application of a particular theoretical construct for a research agenda may produce differences in interpretations, e.g. refer to Mellars (2009) profound disagreement to Chatterton's (2003; 2006) ritual interpretation of fragments of antler points from Star Carr, or the exchange of views between the authors and Thomas (2008) as the principal responder on the importance of agents, identity and group identities in prehistory (Knapp and van Dommelen 2008).

3.3.2 Variation as process

Variation may be recognised within the archaeological record, but how do we understand the processes that produce variation? Colebrook (2006, 1) summarises the work of Deleuze as a philosophy of difference with life as becoming as the power to differ. For Deleuze (1988 [1966], 98), becoming cannot be restricted to merely those things that have been produced; it is the capability or power to create. This creative force can only understood when it is confronted with other powers. It is for this reason that Deleuze places technology at the centre stage of becoming, an extension to its power. This does not imply that technology stands as something apart from becoming (Colebrook 2006, 4-5). The product of technology is the manifestation of desire; the production of production itself. Desire or production should be regarded as selfstimulating; it does not necessarily require an exogenous stimulant or intensity. All desire is an investment in the social (Buchanan 2008, 47-49).

The modern world responds and resonates to the likeness or similarity to other things, i.e. simulacra (Deleuze 2004 [1968], xvii-xviii). For example, typology in its base form masks the unique differences and variations in the morphology and attributes of lithic material and the agents who fashioned those pieces of stone. Deleuze (*ibid*, xviii) refers to such concepts as negative difference, where variations in things are obfuscated by the quest for the identical and the western rationality of the ordering of difference.

The simulacrum is redefined as becoming and not as a secondary representation or image. It is a model for the potentiality of contestation and challenge in a given domain and considered in terms of how different or variation is connected to different by difference itself (*ibid*, 143). The hunter-gatherer group who occupy a site and knap stone do not have a prior 'identity'. It is negotiated and renegotiated by repetition, which is understood through difference or variation. The infinite numbers of possible relations to things become tangible because of those relationships; a power or the potential to create is not pre-determined (Colebrook 2006, 6). This highlights the potential difficulty of tracing hunter-gatherer communities across the landscape, which may only be achieved by adopting a structure with the *chaîne opératoire* as a principal component. For example, technology as becoming is a seriatim of perceptions; a virtual power to relate (Deleuze and Guattari 1994, 154). The lithic assemblage as a product only has a perceived meaning through the connectivity of the responses to it. It is through this relational aspect that the archaeologist may formulate an interpretive research framework to understand the significance of the material culture. Colebrook (2006, 7) drawing on Deleuze's (1986 [1983]) work on cinema explains that the perception of things is conditional upon choice and will vary from one power or intensity to another. The power of the procurement of raw material and the lithic reduction strategy is limited by its potential and the responses it triggers from the members of the hunter-gatherer group. This exemplifies the potential and importance of the *chaîne opératoire* to understand becoming in Mesolithic studies.

3.3.3 Philosophy of variation: difference and repetition

3.3.3.1 Difference as variation

Williams (2003) advises that the recurrent Deleuzian theme is how to understand the complicated relations between things, which are based on two apparently contradictory principles. Firstly, it is reason which indicates that the actions of the agent are connected to the things that instigate and promote action. Secondly, to achieve this inter-connectivity with all things, the agent must disregard and leave behind the fixed notion and physicality of things. It is 'forgetting' that allows the agent to react to changes and difference in things and forge new connections. The agent is the vehicle of connectivity between actual things and the power that produces meaning and significance. This power is technological production which is desire (Deleuze and Guattari 2004 [1972]).

This process can be distinguished from objectification. For example, Tilley (2006) suggests that it is through objectification that the archaeologist may determine what things are and what things do within a social dimension. The artefact is the embodiment of a concept realised in the form of a material thing. The process is integral to our understanding of practice and how things characterise the social being. The technology of stone working is, therefore, implicit in concept although something apart from the agent. For Deleuze technology is explicit as a power that is inseparable from the agent; like the Möbius strip they can be understood as the one side of two sides of a sheet of paper. With each blank struck from a core the knapper experiences a new connection which results in some pieces, although typologically similar, being 'forgotten' and others chosen, either for unmodified use or for modification. The outcome of these new connections represents different recognised from difference itself. Following the Deleuzian principles, it can be argued that the knapper did not choose the blank for use or modification because of the quintessential nature of the blank, but the expression engendered from relational recognition of difference. This second principle of 'forget everything' can also be applied to the self-awareness of identity and group identities. The hunter-gatherer will generally not be continually consciously aware of all of the multifaceted aspects of their identity. However, as they encounter new forces and undertake tasks within the social dimension; the repetition of habitual behaviour negotiates, renegotiates and reaffirms both identity and group identities.

Deleuze (2004 [1968], 142-146) makes a distinction between actual difference and pure difference; also referred to as difference in itself. Actual difference is defined by the characteristics and the attributes of each blank. In contrast, pure difference relates to the intensity of power; the conceptual scheme of the reduction strategy. The relationship of the actual to the conceptual is understood by reciprocal determination (cf. Section 3.3.3.4). The inseparable nature of this relationship determines that the actual identity as becoming of a thing comes from repetition (Williams 2003, 11).

3.3.3.2 Repetition as difference or variation

Hoskins (1988) explores the notion that things may create self-awareness and define the agent as part, and not apart from the social body. One could argue that for Deleuze, 'embodied technology' is the inseparable nature of the repetition or renegotiation of the relationships within the social dimension, i.e. becoming that is not only the power to create the agent but also things. The social body through repetition will create variation. Each agent and thing as a product of a network of social relations will be individually constituted. For example, it can be argued that agents would be actualised with different embodied technologies, resulting in task differentiation (after Deleuze 2004 [1968]).

Williams (2003, 11) restates the Deleuzian tenet that the identity of a thing cannot exist prior to repetition. The concept of interchangeable beings referred to as the 'body without organs' is a form of constant flux, i.e. becoming (Deleuze 1990 [1969]; Deleuze and Guattari 2004 [1972]; 1987 [1980]). The physical body comprises of powers to differ but is actualized by social production, which is the process of desiring and producing becoming (Colebrook 2006, 130-131). Guided by Kopytoff (1986) who suggested that things cannot be completely understood by looking at only a given point in their existence, Gosden and Marshall (1999a, 169) note that the biography of people and things is inextricably woven together in a sequence of repetitive transformations through time, movement and change. There are resonances with Strathern's (1998) work in Melanesia where the agent is produced by social relations. In Deleuzian terms, the person as 'intensities to differ', or 'body without organs' cannot exist prior to social relations. For Strathern, the production or accumulation of things as gifts in turn create a recursive relationship between people and things. Identity is, therefore forged and perpetually renegotiated through a network of relations (Gosden and Marshall 1999a, 173), i.e. becoming. This underlines the Deleuzian tenet that a person is never 'well defined' (Williams 2003, 14). It follows that things are multi-authored because they are forever bound together with the people who had earlier produced and passed on those things as gifts. The trajectory of things within the complexity of social body implies that things can be considered as:

> "... detached parts of people ......where people can be subject and object" (Gosden and Marshall 1999a, 173).

This may be distinguished from Dobres' (2010, 104) "mutual becoming of people and objects" on the basis that people and things are defined in opposition.

This concept forces us to consider the notion of multiple realities. Heisenberg's 'uncertainty principle' concerns photons which exist simultaneously as matter and light in the form of particles and waves. Bohr, in developing what became known as the *Copenhagen Interpretation*, noted that between two points a photon would travel an infinite number of different paths simultaneously. It was only when a path of a particular photon, either as matter or, light was observed and recorded that it became frozen in reality, and thereby changed its nature. If it is recorded as matter; it is not light (Heisenberg 1930; 1958). The issue is that if a theoretical approach privileges, either the subject over the object or, the object over the subject then any understanding will be flawed because the archaeologist has changed the nature of the inseparable relationship between the social body and things (cf. Barad 2006).

The complexity of the multi-authored agent and the relation to things, which are not only multi-authored, but also as detached parts of agents suggests that to define agency may not only be theoretically reductionist, but serve to deny and constrain our understanding of becoming as variation by repetition.

Each thing is a product of a network of social relations. Identity does not have primacy over variation; it is variation through repetition that creates becoming 'identity'. The social body seeks to create a thing based on the virtual concept of pure becoming. It is the difference between pure becoming and becoming that actualises variation from one thing to another (after Deleuze 2004 [1968]). In contradiction to Edmonds (1997), the lithic scatter is not the embodied material remains of past actions but the detached parts of people, where people are both subject and object (after Gosden and Marshall 1999a) as becoming forged in the social dimension. The *chaîne opératoire* as the forum for methodological analysis provides the insight into recognising and giving meaning to identity and group identities.

3.3.3.3 Explaining repetition

Repetition is understood as a tri-partite phenomenon. Firstly, repetition is habitual (Deleuze 2004 [1968]). This notion of habitual behaviour may be considered alongside Bourdieu's (1977 [1972]) *Outline of a Theory of Practice* originally published in 1972 four years after Deleuze's *Difference and Repetition*, although not referenced in Bourdieu there are similarities. The predisposition to embodied practice reflects a pattern of acceptable and proper behaviour (*ibid*, 164-171). *Habitus* is a dynamic concept and has its origins in repetition; a form of presencing the past in social practice. It is the medium between structure and agency that produces the recognisable patterning of actions. It may be said that *habitus* defines the inseparable nature of the material world, i.e. *doxa*, and the social dimension at each stage of the *chaîne opératoire* (Dietler and Herbich 1998).

Secondly, repetition relates to recognition (Deleuze 2004 [1968]). For example, the knapper in choosing which blanks to either use, or modify, or discard will determine that those things have a set representational significance. These repetitive sequences would also apply to the secondary modification of blanks. The habitual nature of knapping may be regarded as a continuity arising out of the variation in products from the power of the reduction strategy. The variations in the artefacts speak to the embodiment of the knapper and the inseparable quality of agent, technology and concept. The repetitive quality of the knapping of stone must also recognise the possibility of risk and error as a metaphor for disconnection. Core preparation would reduce the prospect of error in striking a blank, although a mishit may produce a step or hinge termination requiring the core to be modified before future removals can be detached. The core rejuvenation process may indicate the renegotiation or discontinuity of habitual variation and create a new connection where the variation implicit within the core rejuvenation flake permits a re-engagement with the continuity of the reduction strategy. In abstract, it could be argued that the process of core rejuvenation, where new connections are forged out of disconnection, may be viewed as an inherent quality towards the restatement and reaffirmation of the identity of a hunter-gatherer group.

Thirdly, repetition may be understood in abstract to explain how things change. It clarifies the relational connections between the virtual and difference (Williams 2003, 12). The first two repetitions are based on the virtual difference or variation of things and may be described as illusory. The process cannot be divorced from any of the aspects of the *chaîne opératoire* or Conneller's (2000a) extended definition of Ingold's (2000 [1993]) taskscape. Following Williams (2003), the unlimited number of variations arising from these powers or intensities can be generalised in terms of the connectivity of all things but may not be understood on a macroscale. However, even at the microscale it is possible to lose sight of the conceptual scheme and the abstractive nature of understanding. To widen the frame of reference there are basically three primary technologies employed during the Mesolithic period, which are handheld platform reduction, the supporting of a core on an anvil, and bipolar reduction. The choice of reduction strategies used will depend upon the forces and powers implicit within the *chaîne opératoire* when confronted with the power to create. The use of different strategies will have created a series of new connections and new relations and discontinuities. This concept can be equally applied to the different facets for secondary modification of blanks.

Deleuze (2004 [1968], 142-146) sees becoming as the connections between the variations in powers and intensities from the first and second repetitions. Williams (2003, 13) summarises the position in terms that becoming cannot be easily defined; nothing that is fixed can be real and it is difference, which is an inherent quality of all things, that is the key to understanding. The connections to difference in itself and lifting the illusory veil of things which are fixed by definition are understood by the Deleuzian syntheses. However, before considering the syntheses in some detail it is important to understand the differences and the complementary nature in the analogies of 'tree thinking' and 'rhizomes'. Shanks (1992) promoted the phrase 'tree thinking' in archaeology as a trunk and dendritic structure where the meaning and identity of things are fixed by where things are placed. In abstract, the roots of the tree provide the bases of archaeological interpretation (Shanks and Hodder 1995). The concept of rhizomes was introduced into philosophy by Deleuze and Guattari (1987 [1980]; see also Ingold 2000, 422-423). Unlike the tree with its predetermined structure, the rhizome refers to plants which remorselessly cover the ground in shifting patterns of connections and associations (Shanks 1992; Tilley 1993a; Shanks and Hodder 1995). Where 'tree thinking' seeks to replicate the image or structure of an object of thought; rhizomatics decrees that things are continually reconstructed and, therefore, cannot have a definitive or fixed identity (Shanks and Hodder 1995). Rhizomatics is becoming; it is the structure for the connections of the multiplicities of variation (Jensen and Rödje 2010a, 21).

3.3.3.4 Deleuzian syntheses

For Deleuze (2004 [1968], 90-104), habitual behaviour is the product of a synthesis of the experiences of earlier repetitions. Representations in memory are a synthesis of past memories resulting from a synthesis of experiences (Williams 2003, 13-14). The synthesis, which is perpetually evolving, may be considered as a rhizome due to connections and associations in a shifting series of intensities producing pure differences which it incorporates within the dynamic and diachronic synthetic process. The changing character of these syntheses, defined as passive by Deleuze (2004 [1968], 91) to avoid a possible inconsistency to the second principle of difference as variation, can be understood by reference to the third repetition. The passive syntheses and third repetition are expressed by the variations from the shifting relations or connections arising from the infinite number of series of past and contemporary intensities (Williams 2003, 14-15).

Causal explanations mask the underlying and unremitting virtual or ideal synthesis (Williams 2003, 14). Deleuze seeks to uncover how a variation can be assimilated or synthesised with other variations to produce a concept. The virtual is communicated by the infinite nature of changing relations producing becomings which are not comprised of undistinguishable things (*ibid*, 14). The process of asymmetrical synthesis explains how concept and intensities are understood through reciprocal determination. The ideal and asymmetrical syntheses, referred to the second synthesis, drive habitual behaviour, recognition and memory. Once again to avoid a contradiction to the second principal, it is claimed that representation or recognition occurs before conceptual consciousness. The third synthesis of reciprocal determination and the third repetition are the conduit between the concept of pure becomings and becomings, and which negates the propensity for stasis inherent within the first and second repetitions. Implicit within the first and second syntheses are notions of the agent who may convey notions of pure difference and intensities. Because it is not possible for an agent to be continuously aware of everything, the synthesis of reciprocal determination does not depend upon conscious choice. The second principle and third repetition can be found in Bourdieu (1977 [1972], 73), where practice involves 'forget everything' with an inherent focus on the unconscious triggers of reciprocal determination. Another similarity of the work of Bourdieu and Deleuze is the recognition of social structures which accommodate the singularity and agency of the individual. Trigger (2004, 47) praises Bourdieu and Giddens for detailing the recursive relationship of culture and social behaviour. Giddens' (1984) structuration theory is reminiscent of Deleuze's synthesis of reciprocal determination and the third repetition where the agent can influence structure through re-affirmation or transformation. Barrett (2001) points out the indivisible nature structure and agency in structuration theory that creates the space for the social dimension.

Firstly, the passive syntheses determine the veracity of the three repetitions and the relational aspect of difference to repetition (Williams 2003, 14-16). Secondly, they give meaning and understanding to the theoretical constructs of repetition, variation and becoming in social structures (after Deleuze 2004 [1968]; Figure 3.2).

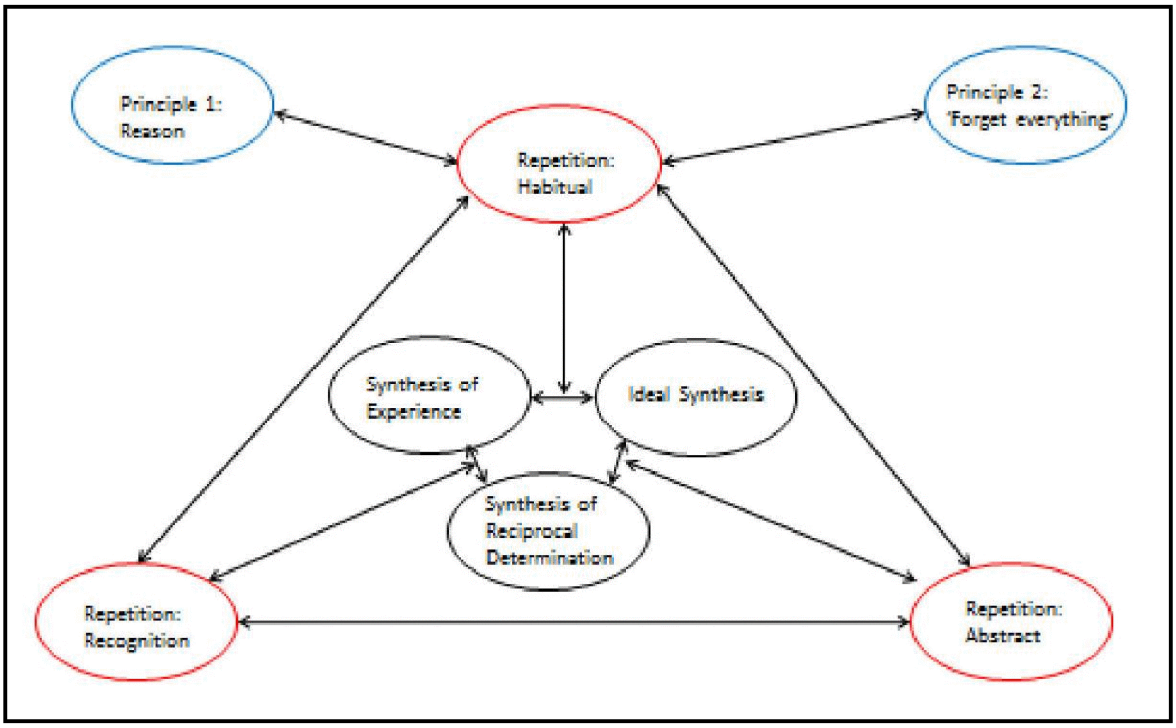

Figure 3.2: Schema for the Deleuzian constructs of repetition, difference and becoming.

3.3.4 Variation: technology and gender as a case study

Gender studies provide insight into the theoretical weave of the Deleuzian constructs of repetition, variation and becoming.

Gender has been defined as a metaphor for difference (Gilchrist 1999, 8). Gender is understood through embodiment and cannot be something apart; it is multi-dimensional (Joyce 2004). Gender is not an inseparable and static essential quality of an agent. It is created and shown clearly in different contexts and in different ways. Gender as becoming is a seriatim of transformations composed within the shifting sands of the relations between people and their material culture, society and landscape resulting in new relations and change (after Gosden 1999, 121-122; after Finlay 1997, 34). The quest for the identification of gender has to be considered and driven from the remnants of the material culture within the archaeological record (Pugsley 2006, 173). It cannot be forced.

Essentialism seems to be an approach that continues to surface in the narratives of Mesolithic of settlement and subsistence. As noted above, Finlay (2000) effectively deconstructed the male stereotype associated with microliths and hunting. Bonsall (1997, 33) in looking at the functionality of the 'Obanian' middens appears to seek refuge in the tautology of cooking= women= lack of knapping skill= bipolar= women= cooking. Rather than forcing the gender interpretation Bonsall should have been asking "how task and action were forged in the intimate social settings of daily activity" (Finlay 2006, 52).

Finlay (2006) extends Gilchrist's (1999) notion that gender is a metaphor for difference to include sex, agency, identity, personhood and how society constructs difference. Gender studies enable the detection of variation at the micro-scale. As a thing is never 'well defined', neither is gender which is socially constructed by repetition producing variation and becoming.

Stone tools may be used differently by different people in certain contexts; the microlith being a good example. The temporal scale determines that as people within hunter-gatherer groups grow older they will hone their skills and acquire knowledge. The passages into maturity and old age may herald an enhanced social standing, where the dynamic within society has to be continually re-negotiated (e.g. Kratz 1988; Morphy 1988). Maturity may also presage gendered notions of taboo and pollution which may affect the relationship of people within the hunter-gatherer group either at certain times, or during the undertaking of specific tasks (e.g. Altman and Peterson 1988; Endicott 1988).

The social and symbolic significance of stone derives from the social context of its manufacture, use and discard. Finlay (2006, 52) goes on to draw upon the work of Dobres (2000) who seeks to move away from analogy by formulating a research agenda incorporating gender to tease out from the archaeological record the recurring daily practice in which gender is made manifest. By writing agency into the *chaîne opératoire* as becoming it may then be possible to recognise how material culture and technological tasks can be viewed as representations within the social dimension (after Finlay 2006).

Even when gender is part of a specific research design it may not be possible distinguish the products of engendered tasks (Sternke 2005). The identification of gender in the archaeological record will always be challenging; analogy highlights the problematic nature of recognition where tasks are viewed as social events which must incorporate both male and female (after Turnbull 1983). If gender is considered, then women have been generally associated with the production of inferior products, e.g. Bonsall (1997). Such observations often have their root in ethnographic studies (e.g. Sillitoe and Hardy 2003). The situation is complicated because flakes which have been produced for use without modification have been recovered from the floors of huts (Johnson 1996), where Gero (1991) suggests that the tasks undertaken by women was likely to have taken place. This notion in itself is complicated because it potentially reduces women to the domestic sphere. For the *Aka*, there is no discrimination in the value of work undertaken by different genders; fathers will devote as much time as mothers in the duties of parental care within a domestic setting (Hewlett 1992), and all members of the *Mbuti* social group will participate in hunting forays, although tasks are gendered they are not hierarchical (Turnbull 1983). The archaeological evidence from the south-eastern Baltic, principally the occurrence and distribution of decorated grave goods, has been interpreted to demonstrate that hunter-gatherer groups did not have a gendered social hierarchy based on economic tasks. Subsistence activities were considered to be of equal significance (Janik 2000; 2005).

The hierarchical classification of one tool form over another or the ranking of subsistence activities, which perpetuates the myth of gender in binary opposition, may blur the potential to understand gender differentiated product, and the relationship between genders within a social setting. To avoid such problems where the tasks potentially undertaken by women are demeaned, it is recommended that the unretouched flake must be given equal prominence to pieces with secondary modification (Gero 1991; Sternke 2005).

Finlay (1997a) questions why children are largely ignored in the interpretation of lithic scatters, and identified the knapping of stone by children at Coulererach on Islay (Mithen and Finlay 2000a; see also Finlay 2008). Similarly, knapping undertaken by children has been recognised in Scandinavia (Sternke and Sørensen 2009). In modern day western societies childhood is a physiological classification (Sofaer 2006), with the social transition to adulthood enshrined within legislative frameworks. During the Mesolithic period was what we would recognise as children viewed as different from others within a hunter-gatherer group? The synthesis of rites of passage compiled by Owens and Hayden (1997) from ethnographies provides us with numerous examples of the importance of rites of passage in the transition from child to adult. Equally, there are societies where either rite of passage does not take place, or where they are only relevant to a specific gender (Herdt 1987).

Different societies will commence this process at different ages; the three stages of separation, liminality and re-aggregation may be completed within a day (Maschio 1995), or continue over many years (Owens and Hayden 1997; Herdt 1987). The liminal stage of a rite of passage is an alternate social structure (after Herdt 1987; contra Turner 1969); a dimension for transformation from one stage of being to another by becoming. Gender although a metaphor for variation should not be viewed as a typological social construct masking the separately constituted variation of the agent through repetition and becoming.

The definition of a child is problematic. The concept of childhood may not be universal. Apart from analogy the archaeological record may provide insights to help with an understanding of what constitutes childhood during the Mesolithic period, e.g. the possibility of recognising differential burial customs coupled with the aging of skeletal remains. Janik (2000; 2005) noted that adults, adolescents and children were interred at the cemetery at Zvejinieki in Latvia with symbolic paraphernalia associated with fishing and hunting and bone pendants. The type of grave goods differentiated between agents of the same age/sex classifications. They also differed on the temporal scale from the Late Mesolithic to the Late Mesolithic/Early Neolithic. The deposition of these grave goods indicated the involvement and collaboration of all members of the hunter-gatherer community in subsistence activities. Children in Danish burials of the Mesolithic period only have attributed grave goods where they have been interred with adults (Mithen 1989; Janik 2005).

Sternke (2005) asks if the child should be regarded as a separate gender. There is merit in this approach; children may be regarded as asexual prior to rites of passage at puberty (cf. Owens and Hayden 1997). Whether children as agents should be incorporated within gender studies generally, or constitute an independent research design has been discussed (Sofaer 2000a; Lillehammer 2000). It has been argued that the latter approach encourages the archaeologist to consider not only the child as agent but also provides a framework that allows reflection on the social relationships with other children and adults (Lillehammer

2000; Sternke 2005). The roles of the children and youths, as pre-adults, of the *Mbuti* in using merciless ridicule against adults as a corrective levelling mechanism to assuage tension and conflict (Turnbull 1978), and the importance of the youths in the *molimo* ritual (Turnbull 1974 [1961]) are particularly good illustrations of these cross-cutting relationships. These scenarios may be regarded as fitting with Janik's (2005) definition of social relationships which accentuates the integrated and inseparable nature of the social dimension, gender and identity.

3.4 Defining technology

There is a requirement to attempt to contextualise 'technology' for my research. Firstly, the importance of the *chaîne opératoire* cannot be overstated. The incorporation of social theory into the conceptual schema creates the backdrop to an understanding of prehistoric technology. Within that framework there is the inherent notion of variation and becoming through repetition. Secondly, attempts to define technology in anthropological studies are considered. Thirdly, a working definition of 'technology' is offered drawing on theoretical constructs from archaeology and philosophy.

3.4.1 Chaîne opératoire and 'meaning in the making'

The *chaîne opératoire*, as the vehicle to describe the sequential nature of the transformation of material, required reassessment to incorporate the social aspects and to give meaning to each stage of embodied technological practice. Practice theory allows the archaeologist to understand technological events in a socially, materially and historically constituted context. Things are the process of becoming and made meaningful through social production, although never 'well defined', they may embody variation in status, gender, skill and knowledge. The technological attributes visible within the lithic assemblage is the conduit to understand practice within a social, material and meaningful dimension (after Dobres 2000, 154-157; after Deleuze 2004 [1968])).

Karlin and Julien (1994, 159) highlight two general approaches in the appliance of the *chaîne opératoire*. Firstly, Dobres' conceptual framework would be described as a 'techno-sociological' analysis. Secondly, the cognitive aspects, or 'techno-psychological' agenda, seek to understand the modes of knowledge used in technological practice (Karlin and Julien 1994, 154). In Deleuzian terms this would be desire, repetition, variation and becoming.

Dobres (2000, 72-95) concept of a sensuous technology is drawn from the philosophies of Kant, Dessauer, Mumford, Ortega y Gasset and Heidegger (Table 3-3).

- Kant explored the notion that the intangible qualities of things-in-themselves could only be understood by human sensations as a socially mediated encounter.
- In contrast, Dessauer determined that it was the sensuous bodily experience of making and using things that was the origin of understanding and awareness of the transcendental qualities of things-in-themselves. An approach which Dobres (2000, 74) considers is similar to the *tekhnē* as it was originally understood. Practice is evident in the way that Dessauer picks out the importance of the bodily experience of encountering material culture which the embodied technology represents the reality of those encounters as expressions of the prehistoric nature of being and knowledge (Dobres 2000, 76).
- Mumford viewed technology as the manifestation of human cognition, coupled with self-realisation emanating from creative aspiration. Material culture as a capability of technology derived from language and symbolic expression within the social dimension (Dobres 2000, 79).
- Ortega y Gasset, like Mumford, develops an evolutionary path where skill and knowledge fired by creative forces and the quest for self-realisation leading to abstract knowledge which is modern parlance is scientific. Where he differs from Mumford and may be seen as following Dessauer is his understanding that the self-aware and active agent is forged in the relationship between the material and the social, which Dobres (2000, 79) claims to have similarities to the concepts of practice and structure.
- This idea of the knowing and self-aware agent is explained and revealed by Heidegger's (1977 [1949]) notion of the embodied and mediated encounters with things, which goes to the essence of technical activity. The phenomenological aspects of technology, i.e. making and meaning, cannot be understood if viewed in isolation from the physical perspectives of making and use. The physicality of technology exemplifies the relationship of the hand to the mind to the social group (Dobres 2001, 49). Technologies in context are about being in the world and not acting upon it (Bourdieu 1977 [1972]; Heidegger 1977 [1949]; Hodder and Hutson 2003; Dobres 2001, 50).

Table 3-3: Development of the construct of sensuous technology (after Dobres 2000).

The experiential relation with a facet of *tekhnē* is what Deleuze would describe as encountering a power or force. Heidegger's 'being there' arises out of the dynamic inter-connections between practice, mind, materiality and knowledge; it is how people become who and what they are within the diachronic and recursive nature of social, symbolic and material structures (Dobres 2000). This process that is Gidden's structuration theory is what Dobres (2000, 161) describes as the "heart and soul of technology".

Dobres (2001, 48) developing the notion of a sensuous technology by describing it as 'meaning in the making' where technology is "a simultaneously personal and collective body of experiences engendered through the hands of knowing, thinking, and feeling agents". Production and the things produced; their use and meanings are inseparable from the people of prehistoric communities which create a *nexus* of socially constituted technology (Dobres 2001, 48-49). The production of things and meaning are indivisible and simultaneous; there is no phenomenological hierarchy (Gell 1998; Hodder and Hutson 2003 [1986]; Lemonnier 1990; Dobres 2001, 50), and technology cannot be understood as extrasomatic.

If technology is about anything it is people centred. The sensuous experience of technology is mediated through technical practice as a symbolically and meaningfully charged arena for social engagement. It is about transformative variations through the creation and negotiation within the social dimension of becomings, meaning, cultural understanding, personal and group realisation by awareness and knowledge, and the development of all skill related practices and identity (Dobres 2000, 125-126).

Conneller (2008, 165) suggests that the *chaîne opératoire* laden with practice theory enunciates a dualism of society and agents. She goes on to suggest that a network approach would resolve this perceived failing:

> "... enabling an exploration of the way in which agency is distributed across particular associations of people and things.... how connections and disconnections are established between different entities" (*ibid*).

Networks, whether defined as technological, or pertaining to people and place, are a series of contingent relations which are considered to reflect the fluidity between structure and agency to facilitate enquiry into the variability of identity and group identities, meaning and things (Conneller 2008, 165). She is drawing in the importance of landscape (cf. Conneller 2000a) and materiality into the *chaîne opératoire*, e.g. the importance of places where raw materials are sourced, and how the materiality of stone is inseparable from source (Conneller 2008, 168-170). The notion of connections and disconnections, and ebbs and flows may be found in *Anti-Oedipus* (Deleuze and Guattari 2004 [1972]; Conneller 2000a). Conneller's (2008, 165) criticism of Dobres rests on the assumption that technology is viewed "as a discrete domain of action". While not denying the network focus as an important facet of the *chaîne opératoire*; the 'discrete domain' ties in the Deleuzian idea of 'forget everything'. Embodied technology as repetition producing variation happens in the moment, e.g. the associations with place and materiality are not necessarily conscious. In the next moment and in each moment thereafter the agent encounters a different set of intensities. A research framework for the *chaîne opératoire* is about giving meaning to these conscious moments within the wider ebbs and flows of connections and disconnections of the unconscious. Dobres (2000) highlights the requirement for a rigorous methodology for identifying, describing and cataloguing the variation in lithic assemblages (cf. Section 4.2).

For Dobres (2000; 2001, 48), each stage of the *chaîne opératoire* can be regarded as “meaning in the making” thereby creating a certain resonance with Pfaffenberger (2001). Technological practice as events is constructed culturally within the social dimension and are, therefore, historically contingent. It follows that the *chaîne opératoire* is concurrently material, symbolic, diachronic and social (Dobres 2000, 129; 2001, 48-49; Schiffer 2001a, 5). The simultaneous and inseparable nature of these facets of the *chaîne opératoire* is drawn from the work of Heidegger (1977 [1949]), Bourdieu (1977 [1972]) and Hodder and Hutson (2003 [1986]). Moving beyond Dobres (2000, 49), technology may be described as sensuous on the basis of the recurrent correlation of the deterritorialised hand to the mind to the social dimension.

3.4.2 Defining technology in anthropology

Schiffer (2001a, 2-3) considers how anthropologists have sought to define ‘technology’ in contemporary studies at the beginning of the 21st century. The research context may indicate variation in the scales of enquiry from the single agent to enduring technologies across space and through time. The anthropologist is seeking to explain variability from the interaction between people and things within the social dimension in which activities take place. Evidence may be drawn from ethnographic studies and from the archaeological record. Keller (2001) regards technology as a manufacturing process as skilled practice, while Ingold (2001) and Pfaffenberger (2001) incorporate the use of things, and Skibo and Schiffer (2001) consider the biographies of things within the domain of technology. Echoing Walsh (1990), Pfaffenberger (2001) suggests that symbols have different cultural meanings to different groups of people, he goes on to determine, using ethnographies from Melanesia, that meaning is not restricted to the finished artefact but is also inherent in the technological activities that fashioned the object. Schiffer (2001b) looks at the mixing together of different elements of modern technologies to attempt to understand how technologies change. Using ethnographic data in the context of Behavioural Archaeology, Walker (2001) seeks to demonstrate that behaviour associated with ritual practice represents ritual technology; an aspirational technology, aligned to the relationship between the physical and the metaphysical. Ideas which fit with the continuity of technological practice as a macro-scale phenomenon during the greater part of the Mesolithic period (cf. Section 8.4).

3.4.3 A working definition of Mesolithic technology

Pirsig (1984 [1974], 298) mentions that the ancient Greeks made no distinction between art and technology. Colebrook (2006, 10) taking a reference from the *Greek Philosophical Vocabulary* notes that 'technology' comes from the Greek *tekhnē*, and refers to any repetitive practice. 'Ology' derives from the Latin *logos* meaning study (Sørensen 2008, 9). Technology may be regarded as 'the study of repetition'. Dobres (2000, 50) notes that using *Webster's Third International Dictionary* and *The Oxford English Dictionary*, the definition of technology can be summarised as referring to practice and practical knowledge, and as such is a modern reductionist notion of extrasomatic technology. Ingold (2000 [1988], 294) suggests that the two phenomena were inseparable in practice in prehistory. In my view Dobres (2000, 58) may argue that Colebrook's *logos* equates to the modern day concept of theory. She prefers to use *logos* as meaning practical reason, i.e. social; defining *logos* as a term from the period of Enlightenment. As stated previously, Deleuze's (2004 [1968]) first principle of difference and variation in determining the relation between things is reason. Dobres (2000, 68) notes that the structure of technology or *tekhnē* is probably not the construction of universal *logos*:

> "but by culturally situated reason and embodied practice... [within] socially constituted and contested codes of organization and task differentiation..."

Technological practice would have determined acceptable modes of how things should be produced and used. The Colebrook definition of 'prehistoric' technology could, therefore, be amended to 'the cultural reason and embodied practice of repetition creating variation as a sensuous becoming within the social dimension'.

The revision to Colebrook's definition still ties technology into the Deleuzian philosophy of variation. As mentioned above Deleuze considers that technology is inseparable from becoming; it is an extension to the power of the agent. Technology is embodied; somatic. A point highlighted by Jones (2008) in an analysis of mortuary practices for the Neolithic and Bronze Age in Britain and Ireland. Colebrook (2006) notes that eyesight falls within Deleuze's notion of technology. It can be argued that the other senses can be similarly attributed with technological standing; evoking Dobres' (2000; 2001) concept of a sensuous technology. Anyone who has engaged in the experimental knapping of stone recognises it as a tactile or haptic and audible experience. The use of sight and touch is inseparable from dexterity, the force of the blow, and hand to eye coordination. The sound of the percussor hitting the object piece may indicate a miss-strike. Generally, there is a certain ring which signifies a clean and anticipated removal. It is possible to smell and taste the fine dust, especially when working with silica based materials (see also Mills and Pannett 2009). Occasionally, a spark will be created and there is an unmistakable momentary odour of burning. Deleuze's concept of 'becoming' can be found when Dobres (2000, 60) demands investigation into prehistoric technologies which created and gave a meaning from the direct experience of agents within the social dimension.

3.5 Summary

The common theme throughout this chapter, whether either considering how the Deleuzian principles and passive syntheses allow us to understand the relation difference and variation to repetition to technology, or agency and practice, settlement and subsistence, identity, group identity, landscape, gender or social boundaries, is the social body or social dimension of becoming, being and experience in the world. Borrowing a phrase from a legal principle, the 'golden thread' in the weave of the theoretical *bricolage* is the *chaîne opératoire*.

For this study, landscape approaches will privilege Conneller's (2000a) extended definition of the taskscape, and the role of technology in the creation of a meaningful landscape imbued with cosmological significance (after Edmonds 1997; after Chatterton 2003; after Cummings 2003; after Jordan 2003; after McFadyen 2008), which could be viewed as a paradox. For example, Mithen (1999) pointed out a greater understanding is required for the cosmology of the landscape, where Finlay (2006, 44) reasonably inquired if cosmology can be inferred from the archaeological record. This apparent disconnection will be explored by the use of ethnographic analogy to offer an interpretation, not to attempt the impossible to say how it was but to stimulate future enquiry in landscape studies.

Investigations into settlement will feature Finlayson's (2006) ideas of how sedentism and mobility are vehicles to understand how hunter-gatherer communities understood their world, and Jordan's (2006) notion that it is through enchainment and fragmentation can be used to explore how hunter-gatherers renegotiated and reaffirmed their becoming in the world as they moved through it.

The *chaîne opératoire* is essential to the creation of a regional profile for West Central Scotland during the Mesolithic period comprising of variation at intra-regional, inter-site and intra-site scales of investigation.

For the purposes of my research, technology is determined to be inseparable from the agent. If a person is actualised by the social body, it may be argued that variation in agents is brought into being by actualisation with different suites of embodied technologies. This process of becoming would continue throughout the biographical life of the person. This may suggest a possible explanation for not only task differentiation and sharing, but also tasks related to age, gender and identity. Desire is production. The product of desire is itself multi-authored as the embodiment of the multi-authored technician; people are both subject and object, which is a manifestation of the embodied enchainment within the social dimension of agent, desire and product. The distributed technician as person and product speaks not only to the identity of the agent but also the group identities of hunter-gatherer communities. It may be argued that it is the social dimension that is the forum for ‘meaning in the making’, but it is technology that creates meaning throughout all the facets of the diversity of the human experience during the Mesolithic period.

Chapter 4: Methodology: investigating variation

4.1 Introduction

The work on the collections and assemblages has involved the characterization of more than 10,000 lithic artefacts, of which approximately 8000 have been subjected to detailed technological analysis. In respect of sampled collections/assemblages a further c.6000 artefacts have been looked at as a scoping exercise or appraisal, which is to ensure that the grab samples (Section 4.2.3) are representative of the general profile of the material recovered considered, and ascertain the presence of anomalous artefacts.

This chapter introduces the specific aims and objectives for a research framework incorporating an analytical methodology and its theoretical underpinning (Section 4.2). Firstly, this involves adopting a secure methodology for typological and technological analysis of lithic artefacts and the use of databases to facilitate the interrogation of material to provide the basis for coherent and sustainable interpretations (Section 4.2). The nature of lithic scatters as an archaeological resource is explored, including aspects of bias in surface collections (Section 4.2.1) and excavated assemblages (Section 4.2.2). A sampling strategy (Section 4.2.3) is put forward to achieve the stated aims. Secondly, it outlines the adoption of a transect across the landscapes of South Ayrshire and South Lanarkshire within the research area, with three outlying sites acting as a control. Statistical data for geographic area and the number of sites within the transect area are compared to the corresponding data for the research area to justify the efficacy of the approach (Section 4.4).

The format of the databases for sites and the analysed assemblages is presented. The assemblages from the coastal and inland sites analysed are introduced and details are given for the grab samples for those locations where the assemblages have not been subject to full analysis, with notes on geographic location and topography (Sections 4.5 and 4.6).

The solid and drift geology (Section 4.7) is recorded for each geographic location from which assemblages have been chosen for analysis to determine the availability or otherwise of raw materials. Finally, there is a brief outline of issues relating to variations in reductions strategies and the interpretation of bipolar artefacts (Section 4.8) implicit within the methodology for technological analysis of artefacts (chapters 5, 6 and 7).

4.2 Research methodology

Theoretical perspectives from the preceding chapter, in particular Deleuze (2004 [1968]), determine that each lithic is individually constituted representing variation through repetition, and is itself the desire of a seriatim of moments manifest as attributes. The assemblages represent connections and disconnections in the *chaîne opératoire* (Conneller 2000a; 2005). The bias in recovery, whether through surface collecting or excavation (cf. Gardiner, 1987) determines that the lost moments speak to the disconnection. The assemblages, therefore, correspond to an interrupted connection comprising of an incomplete conflation of forgotten, chosen and memory moments. These moments are the embodiment of the inseparable quality of all aspects of Mesolithic lifeways.

The research methodology for technological analysis has to be sufficiently robust to permit the recognition of:

- Raw material choices;
- Nuances of variation at intra-site and inter-site levels for both primary and secondary technologies at both coastal and inland locations to facilitate comparison; and
- Intra-regional profiles of coastal and inland occupations during the Mesolithic period.

The first stage in the *chaîne opératoire* is the location and the harvesting of raw material. It is, therefore, crucial to consider the local solid and drift geologies to ascertain the availability or otherwise of raw materials.

The parameters of variation are set against the background of the continuity of technological practice (chapter 3), which may at a macro-scale obfuscate variation. The investigation of micro-phenomena as moments will highlight localised variations in the choice and utilisation of raw materials, the composition in the variations of tool forms and in the manufacturing practice of modified artefacts.

It is through the fine-grained technological analysis of variation and the *chaîne opératoire* that it may be possible to distinguish personal and group identities, and understand how different hunter-gatherer groups have created variations in the inscription of their landscape. If technology and the hunter-gatherer are indivisible and following Gosden and Marshall (1999a), where people and things are both subject and object as part of the social body, it is possible to offer interpretations of identity and group identities. For example, choices in raw materials may indicate different hunter-gatherer groups, their claims and the significance of place and rights to resources across the taskscape (Conneller 2000a; 2005; 2008). The continuity of technological practice may be said to draw a veil over the recognition of identity. It is the conflation of attributes as moments that potentially allows the analyst to see the work of a hunter-gatherer. This may be as a result of the lateralisation of artefacts, the morphology of tool forms and the subtle nuances detailing common differences in the variation arising out of technological practice.

The methodology, type and attribute terminologies employed for the analysis of the primary and secondary technologies follows the format devised and adopted for the *SHMP* (Finlayson *et al.* 1996; 2000), which built upon the research design used for the analysis of the lithic assemblage from the site at Kinloch on Rùm (Wickham-Jones 1990), which was itself derived from the terminologies and technological classifications espoused by Tixier *et al.* (1980); subsequently enhanced (Inizan *et al.*1999). Reference is also made to the terminologies from Camais Daraich (Wickham-Jones 2004a). The methodology includes Finlay's (2009) microlithic fragment and breakage schema, and aspects of Madsen's (1992) classification scheme for primary technological attributes. Many of the terminologies associated with these analytical methodologies are explained in the glossary of terms (Section 11). The field categories for the site lithic databases may be found at digital appendices VI and XIII.

This research methodology was successfully tested in the technological analysis of the lithic assemblage from the inland site at Climpy (Wright 2008; Innes *et al.* forthcoming). It was subsequently added to and refined for the purposes of this study.

The technological analysis of a lithic assemblage is reflexive which, therefore, demands a robust methodology to permit fine-grained and meticulous recording of attributes. This data is then continually cross-referenced to determine that the interpretation of the assemblage is coherent, and provides a secure basis to achieve the aims and objectives of the research project (Finlayson *et al.* 2000).

Primary Technology speaks to those initial procedures of the *chaîne opératoire* relating to the choices made in the selection and the obtaining of appropriate raw material, the reduction strategies, the production of blanks, e.g. flakes and blades through to the discard of cores. The knapping reduction strategies undertaken in the past are determined by reference to the detailed analysis of the characteristics and attributes of the cores and debitage products recovered during archaeological fieldwork (Woodman *et al.* 2006, 78; Finlay *et al.* 2000, 553).

Secondary Technology refers to the later stages of the *chaîne opératoire* which considers the process of the modification of blanks, their utilisation and discard. Following the removal of a blank from a core, modification is generally achieved by the application of pressure to the edge of the blank. In the case of scrapers the modified edge functions as the working edge. However, that may not be the case for all retouched artefacts. For example, the modification may be undertaken to facilitate hafting (Wickham-Jones and McCartan 1990, 87; Finlay *et al.* 2000, 571).

There are certain factors affecting the research methodology creating additional bias:

- If only the remnant of a platform remains, the blanks have been assumed to have derived from simple platforms. For the purposes of the analysis those pieces where the proximal end is absent and the artefacts do not possess any attributes associated with a bipolar reduction strategy, they are also deemed to have been struck from platform cores.

- It is often difficult to determine if chert has been burnt. The incidence of burnt pieces may be understated. Experimental work carried out on raw materials found during the excavations at Kinloch on Rùm found that only 89% of burnt pieces would not have been classified as such due to the absence of burnt attributes (Finlayson 1990, 53).

- Bipolar blanks will be under-represented because not all debitage products will present with attributes associated with a bipolar reduction strategy (Kuijt *et al*. 1995, 117).

- Use wear analysis was not undertaken. Those artefacts presenting with edge damage have considered macroscopically determining that the edge damage was use induced. Edge damage may be as a result of either the reduction strategy, or post-depositional taphonomic factors such as re-use, trampling (e.g. McBrearty *et al*. 1998; Neilsen 1991), or ploughing (e.g. Mallouf 1982).

- The frequency of microburins may be under-represented due to artefacts not presenting with classificatory attributes. Experimental work manufacturing microliths using a microburin technique showed that in 20% of cases there was no identifiable microburin (Finlay 2003b, 174).

The original colour of artefacts, where fresh as opposed to burnt, patinated or weathered, is recorded by reference to a general category of hues from Munsell®.

4.2.1 The bias of recovery: surface collections

Gardiner (1987, 57) makes explicit the incomplete nature of surface collections often including artefacts from different archaeological periods, and can be referred to as a decontextualised conflated resume of archaeological activity unrepresentative of the totality (after Barrowman 2003, 99-100). For Gardiner (1987, 53-54), the primary focus is making enquiry of the amateur archaeologists engaged in fieldwalking. Firstly, can you be sure that all that was seen was collected, or does the collection simply represent a selection, e.g. focusing on modified pieces to the detriment of cores and blanks? Secondly, did those fieldwalkers know what they were looking for? In these regards we are fortunate to be considering the surface collections from the work of committed and knowledgeable amateurs, who collected modified pieces, cores and blanks and often pieces of small fraction debitage.

Collections from systematic fieldwalking may provide insight and give an overview into the distribution of activity areas (Gardiner 1987, 57), assist in the creation of geographic models utilising lithic scatters as representative of sites within the landscape (cf. Allen 1991; Wagstaff 1991), and offer explanations for patterns in land-use (cf. Foley 1981; Barrowman 2003, 100). Schofield (1995a, 5; 1995b, 108-109) suggests that bias is inherent; there is nothing that can be done about it, however, recognising the limitations of surface collections they remain a valuable resource to understand and give meaning to lifeways.

Further bias is unavoidable in the sampling of surface collections for technological analysis. The sampling strategy should attempt to limit that accumulating bias (Section 4.2.3). Aspects of bias in excavated assemblages are covered at Section 4.2.2.

4.2.2 Palimpsests

Bailey (2007, 203) defines the palimpsest as a:

> "...a superimposition of successive activities, the material traces of which are partially destroyed or reworked because of the process of superimposition."

The definition can be expressed in terms of variation, i.e. variation created by repetition superimposed by other variations from either similar or distinct repetitive practice. Assemblages represent the remains of a seriatim of tasks that create and recreate the archaeological record. The base principle for the interpretation of an assemblage is to recognise the origin of variations within it

(Shott 2008, 59). The nature of the palimpsest hinders, and may mask episodes of human behaviour, identity and group identities (Bailey 2007).

Many of the assemblages for the Mesolithic period in Scotland, whether recovered from field walking or excavation are palimpsests of successive actions. The distinctions between episodic events are generally “blurred, distorted, time-averaged palimpsests” (Straus 2008, 216), which is a view echoed by Holdaway and Wandsnider (2008; 2008a, 5) who go on to advise that time averaged assemblages do not equate to either an average in time, or a behavioural average.

Straus (2008) counsels against using type fossils on the basis that it is not unknown for pieces relating to earlier periods to be copied in later periods. The possibility of technological conflation may present the analyst with enormous problems in either recognising palimpsests, or distinguishing technological attributes to ascertain behavioural episodes (Holdaway and Wandsnider 2008a, 5). Taphonomic processes, either human or environmental, may be responsible for lithics recovered from contexts both spatially and temporally distant from the original point of manufacture, use or discard (Straus 2008). Because stratigraphy in Mesolithic contexts in Scotland is generally absent (e.g. Jardine and Morrison 1976) the main emphasis must be on the horizontal and spatial distribution of pieces (Straus 2008, 216; Sullivan 2008, 45).

Straus (2008, 217) also considers the problems associated with sampling; what he describes as “sampling accidents”. The underlying premise is that occupation activities are likely to be spatially diverse with discrete areas for different tasks, which would have produced a potential clustering of lithic distributions. Limited excavation strategies may produce assemblages which represent activities or discard patterns particular to a certain location within an overall site complex. For example, certain pieces may be discarded within specific areas; serendipity will determine whether or not those locations are excavated. Past excavations, i.e. those not undertaken to modern standards or field walking may only produce an average of past events showing the diachronic pattern of reduction strategies. Open area excavation incorporating wet sieving, and the three dimensional recording of artefacts will not only produce an enhanced recovery of lithics (cf. Wickham-Jones 1990, Table 9), but also allow the drawing of detailed plans of the spatial distribution of artefacts. Variation in the composition of an assemblage will be determined by the recovery strategy employed. Even excavations undertaken to the highest professional standards may not be indicative of what was produced at a specific location, e.g. raw materials, blanks and tool forms may be either curated, or reused or recycled or subject to abandonment strategies outwith the area under investigation (*ibid*, 217-218). Straus is advising the archaeologist to make critical enquiry into the granularity of any given assemblage.

To determine if a lithic scatter represents a single episode of occupation rather than a palimpsest may be difficult to sustain. The term 'single phase' may not necessarily imply only one visit to a site. There may have been a number of visits over a relatively short period of time (Saville 2008, 212). If the physical character of the site and the tasks undertaken are constant throughout the periods of occupations then it may be very difficult to distinguish between a single phase occupation and a palimpsest.

Different recovery strategies and methodologies will produce distinct assemblages. The comparanda of assemblages, either from some decades ago, or from a limited excavation strategy, or a surface collection from field walking, or with an assemblage recovered using best professional practice may be "akin to comparing apples and oranges" (Straus 2008, 218).

4.2.2.1 The palimpsests of West Central Scotland

All of the assemblages analysed are palimpsests ranging from sites indicating at least two distinct phases of activity at Climpy, Daer 84 and Daer 85, and possibly multiple phases at the other sites.

The surface collections from Ballantrae, Girvan and Loch Doon together with the surface/excavated assemblage from Weston are mixed period, including post-Mesolithic events. It is possible that later episodes are also present at Powbrone. However, the character of the assemblages suggests that the majority of the artefacts may relate to Mesolithic events. The surface/excavated assemblages from Climpy, Daer 84, Daer 85 and Daer Reservoir relate solely to Mesolithic events. The only assemblage recovered from a largely undisturbed ground surface is at Climpy where artefacts were either recorded in either three dimensions or 25cm ^{2} grids or from context samples (Innes *et al.* forthcoming). Apart from Climpy, where fieldwork was undertaken by a professional unit, the surface/excavations at Daer 84 (Ward 2005b), Daer 85 (Ward 2004a), Daer Reservoir (Ward 2000; 2001), Powbrone (McFadzean 1981) and Weston (Ward 2006) were undertaken by amateur archaeologists and local societies. The data for the recovery of artefacts ranges from 1m transect blocks, context and general locations within an excavated area. The majority of the lithics from Daer 85 were recovered by wet sieving the spoil; the only site to utilise this recovery method.

In summary, surface collections have an inherent bias where it may be argued that the lost moments may exceed those moments recovered. The issue is further complicated by the presence of artefacts typologically dated to a later period. The recovery methodologies adopted for the excavated assemblages, Climpy to a much lesser degree, have created bias not only the quantum of pieces recovered but also in terms of spatial distribution. The difficulty is set out a sampling strategy to ensure that apples are not compared to oranges.

4.2.3 Sampling strategy

Reference has been made to a number of publications on sampling in archaeology (Cherry 1978; Torrence 1978; Cherry *et al.*1978; Orton 2000; Banning 2000; Fletcher and Lock 2005). Experiments undertaken by Torrence (1978, 384-385) indicated a sample size of 20% will produce a standard error of up to ±0.5 indicating a confidence level of 95% or better. There is no standard currently used in Mesolithic research, e.g. compare the strategies adopted at Rùm (Zetterlund 1990, 64-65) to Staosnaig (Mithen and Finlay 2000).

The assemblages from Climpy, Daer 84, Daer 85 and Powbrone have been fully analysed both typologically and technologically. The surface collections from Loch Head were typologically analysed with technical analysis focusing on grab samples of those items considered to be unequivocally Mesolithic, namely platform cores, tool forms and blades (Section 4.6.1). Although the other assemblages were not subject to a complete typological analysis, a similar strategy for technological analysis was adopted for Ballantrae (Table 4-3), Girvan (Table 4-5), Daer Reservoir (Section 4.6.2) and Weston (Section 4.6.3). Generally, grab samples exceed 20% of type.

4.3 Digital databases of sites and assemblages

The site and assemblage databases have been prepared using Access 2007™. Appendix II catalogues the sites where Mesolithic or putative Mesolithic artefacts have been recovered in the research area, and includes key data to facilitate interrogation (Table 4-1). All coastal sites are within 3.30km (Sections 4.5.1 and 4.5.2) from the modern coast; the majority are within 2km.

The database also includes those sites from Wigtownshire, Kirkcudbrightshire and Dumfriesshire, the former local authorities which now comprise of Dumfries and Galloway. There are sites from Loch Doon transverse the border of South Ayrshire and Kirkcudbrightshire. Loch Doon was a possible routeway from through the Galloway Hills for hunter-gatherer communities and, therefore, all of the sites from Loch Doon, together with Smittons are classified as being in the research area.

- Site name, location and Ordnance Survey National Grid References;
- Whether assemblages are a result of excavation, evaluation, watching brief, surface collections or residual stray finds;
- Sites are noted as either coastal or inland. The majority of the inland sites have a height above ordnance datum;
- Where radiocarbon dates are included there are details, where possible, of material type, laboratory dates and laboratory reference;
- Indication if structures or other occupational features are present;
- Bibliographic references; and
- Brief notes on the location and particulars of the assemblages and features.

Table 4-1: Table of key features for site database.

The databases of the chosen assemblages from coastal and inland sites (Sections 4.5 and 4.6) also use Access 2007™. Each artefact is allocated a unique catalogue number. In addition, to the attribute data the databases include, where available, site, context from which it was recovered and museum references, where applicable.

4.4 Research transect: justification of framework

As at June 2011, there are 318 sites in the research area, comprising of hundreds of thousands of pieces of worked stone. It was not possible to undertake a detailed a typological and detailed technological analysis of the assemblages from each location; an alternative strategy was required. A research transect has been taken from Ballantrae and Girvan on the Ayrshire coast across South Ayrshire to Loch Doon and onward to the Daer Valley of South Lanarkshire (Figure 4.1). In addition, three inland sites outwith the transect, namely Powbrone, Climpy and Weston have been included to act as a control on the inland assemblages within the transect.

Information gathered from local authority websites shows that the research area, including the islands of Arran, Bute, Greater Cumbrae, Little Cumbrae and Inchmarnock is 7007km². The research transect is c.2550km², i.e. 36.39% of the research area. 42.45% of the sites, including the outliers fall within the 'research transect' (Figure 4.1). These statistics are considered to substantiate the efficacy of the research transect strategy.

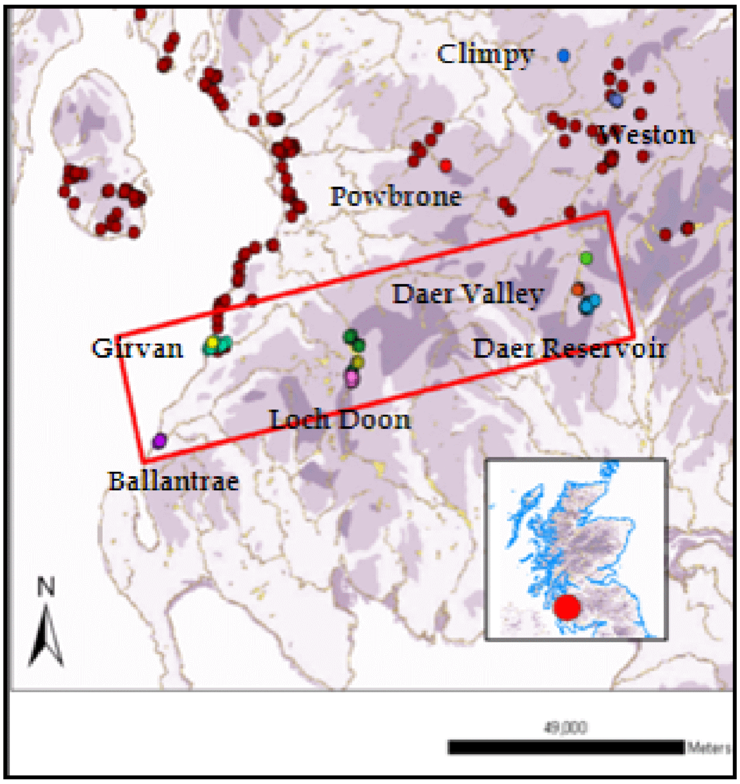

Figure 4.1: Map of research area showing all Mesolithic and putative Mesolithic sites in the research area, and the location of sites within the transect and the outliers. Scale = 49km.

4.5 Research transect: coastal sites

The coastal locations of Girvan and Ballantrae have been chosen for a number of reasons. Firstly, both areas were subject to extensive systematic fieldwalking by amateur archaeologists. Rescue archaeology was undertaken by Affleck (1986a) at Garleffin, Ballantrae in 1985, and other projects, principally carried by GUARD in the Girvan area during the 1990s led to the discovery of a number of sites (Abernethy 1996; MacGregor and Donnelly 2001; Donnelly and MacGregor 2005; Banks *et al*. 2008; Finlay forthcoming a). Secondly, the concentration of sites gives weight to the notion that the environmental stability and diversity of the habitats at Ballantrae and Girvan would have been particularly inviting to hunter-gatherer groups [Section 2.5.1] (Jardine and Morrison 1976; Morrison and Hughes 1989). Thirdly, modern rescue excavations at Littlehill Bridge, Girvan (MacGregor and Donnelly 2001) uncovered sunken floor dwellings which may have been occupied over a sustained period, and may point to multiple phases of sedentary occupation during the Mesolithic period (chapter 8).

4.5.1 Ballantrae

The locations for the recovery of lithic artefacts are shown at Figure 4.2. The surface collections were recovered from or in the vicinity of the c.15m OD raised beach. The majority of the sites are south of Ballantrae on the southern floodplain of the River Stinchar. The assemblages are predominantly flint.

From two letters written by Edgar to Callander at the NMS dated 18^{th} and 27^{th} July 1935 it is known that during the early 1930s Muirhead was involved in garden trenching for a newly constructed bungalow known as ‘Greddock’, also referred to as ‘Craddock’ by Edgar. A substantial lithic assemblage was recovered, including a microlithic component. The Muirfield collection was reappraised by Sludden (2004), which involved a basic typological analysis. Sludden (2004, 17) notes that Muirfield’s collection includes lithics from the vicinity of the raised beach due west of Greddans (Figure 4.2), and one artefact may have come from Glenluce Sands, Wigtownshire.

Figure 4.2: Satellite image of Ballantrae showing location of sites. Image from Google Earth © 2011 Getmapping plc.

Prompted by Muirfield's finds, Edgar undertook field survey in the mid to late 1930s investigating a transect from Downan Burn to Greddock, and also in the vicinity of the standing stones at Garleffin. There were 30 and 165 artefacts collected from Greddock and Garleffin, respectively and 3138 from the Downan Burn to Greddock transect (Edgar 1939; Lacaille 1945, 85). A rescue survey and evaluation was carried out by Affleck (1986a) on the raised beach at Garleffin. An assemblage of 100 artefacts was recovered from test pits. The assemblage is now lost (Professor Kevin Edwards pers. comm.), although Affleck's (1986a) report constitutes a provisional statement.

Gray (1956) similarly conducted a systematic survey in Ballantrae recovering 2156 artefacts from eight locations south of the River Stinchar and 42 from three north of the river. Site 5 produced 69.56% of the surface collection; Site 4 10.83% and Site 4N 8.00%. MacNeill (1965, 13) surveyed ploughed fields at the edge of raised beach and collected a small number of artefacts from two locations.

Edgar donated 1759 artefacts to the NMS in 1954, and reported that there are 769 artefacts from the collection at the Dick Institute, Kilmarnock. Enquiries have not revealed where the remainder of the artefacts are held. Gray donated his entire collection to the NMS in 1969. The Muirfield collection is held at the Hunterian Museum and MacNeill's at the University of Glasgow.

Table 4-2 sets out the sites from which artefacts were recovered and highlights those collections sampled for analysis. The grab samples by artefact type from each of the collections are shown at Table 4-3, which represent 11.06% of Gray's collection; Edgar 13.76% of the artefacts held at the NMS and Muirfield 8.00% (Appendix IV).

Ballantrae	
	NGR
Principal sites: sampled	
Edgar/Miurfield	NX 08722 81640
Garleffin: Edgar	NX 0873 8172
Gray Site 4	NX 084 814
Gray Site 4N	NX 084 815
Gray Site 5	NX 085 817
Gray Site 5W	NX 085 816
MacNeill	NX 087 818
Other findspots	
Gray Site 1	NX 073 806
Gray Site 2A	NX 082 813
Gray Site 6	NX 091 821
Gray Site 6A	NX 092 820
Gray Site 7	NX 085 824
Gray Site 8	NX 085 824
Earth face site	NX 085 824

Table 4-2: Details of principal surface collection sites sampled and other sites from Ballantrae.

	Gray	Edgar	Muirfield	MacNeill
Grab samples:				
Cores	64	39	30	3
Flakes	20	16	46	
Blades	56	89	66	5
Tool forms	103	98	47	1
Others			3	
Total	243	242	192	9

Table 4-3: Details of grab samples of Mesolithic material from principal sites from Table 4-2.

4.5.2 Girvan

The majority of the sites are either from, or in the vicinity of, the raised beach (Figure 4.3). Dailly 2 is approximately 3.30km inland and represents the most easterly location where artefacts have been recovered. Accordingly, it arbitrarily marks the extent of assemblages determined to be coastal.

Girvan 12 is not shown on Figure 4.3; it is located on the raised beach south of the town of Girvan. The other sites are all north and north-west of Girvan on the northern floodplain of the Water of Girvan apart from Girvan 11, Enoch Farm, Dailly 1 and Dailly 2 which are situated on the southern floodplain. Flint is similarly dominant in the assemblages.

MacNeill carried out extensive and systematic fieldwalking survey from 1973 to 1976, inclusive. All of the sites, other than those assemblages related to rescue archaeology are as a result of his survey work. The importance of MacNeill's survey work cannot be overstated, and demonstrates a significant contribution to our understanding of this period.

A watching brief at Girvan Mains recovered two artefacts reported as possibly being of a Late Mesolithic/Early Neolithic provenance (Abernethy 1996). Lithic assemblages collected from fieldwalking surveys carried out by GUARD at Gallow Hill and Littlehill Bridge during the 1990s resulted in rescue excavations at both locations (Donnelly and MacGregor 2005; MacGregor and Donnelly 2001). The surface and excavated assemblages from the raised beach in the Gallow Hill area alone amount to c.4300 artefacts (Donnelly and MacGregor 2005, 47). Small mixed period assemblages were recovered from two rescue excavations carried out at Grant's Distillery (Banks *et al*. 2008; Finlay forthcoming a).

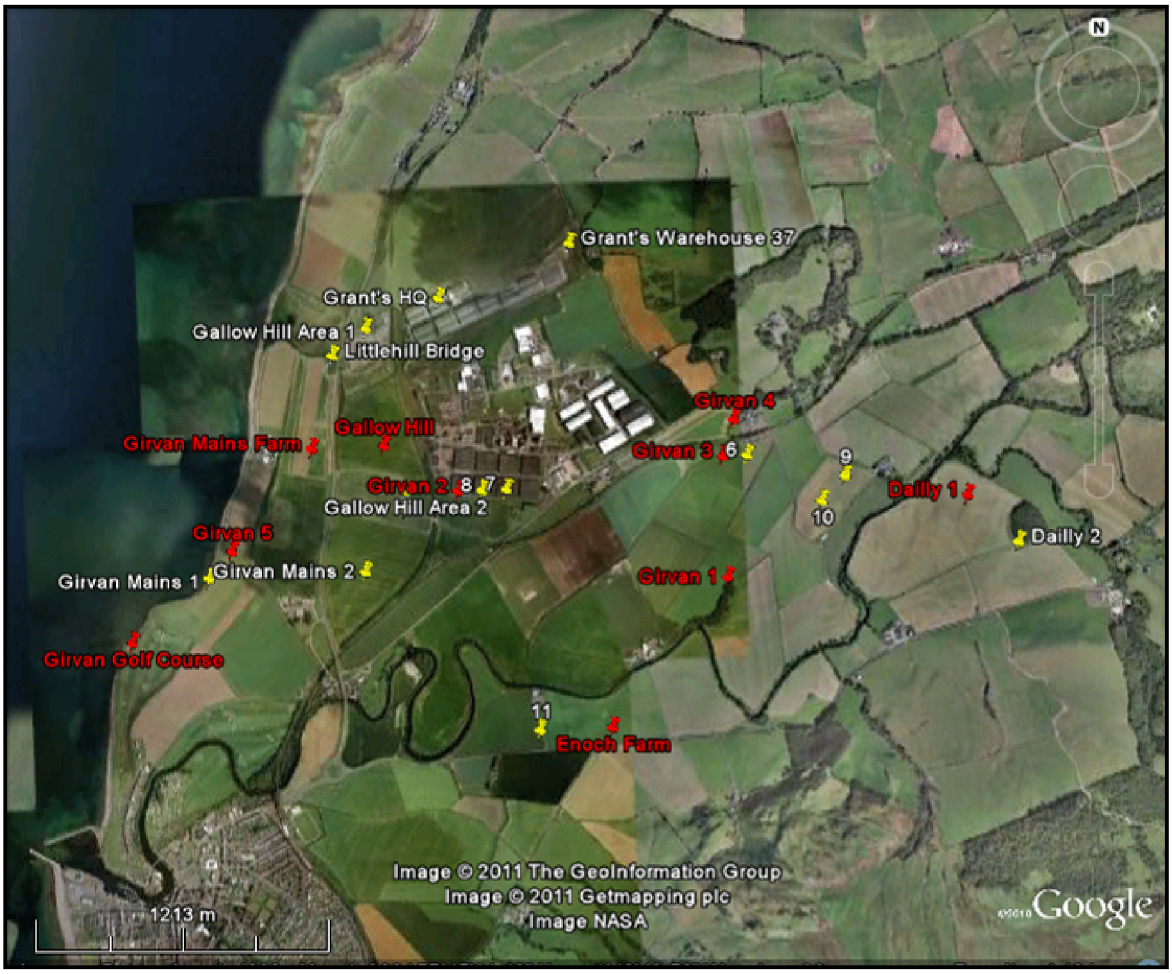

Figure 4.3: Satellite image of Girvan showing location of sites. The sampled assemblages from MacNeill's surface collections are shown in red. Image from Google Earth © 2011 Getmapping plc.

The technological analysis of artefacts from Girvan focuses on McNeill's collections. Donnelly sorted the collections roughly by artefact type, which facilitated grab sample procedures. The work was undertaken as an aspect relating to the publication of the field survey and excavations at Gallow Hill (Donnelly and MacGregor 2005). The principal and subsidiary sites sampled are shown at Table 4-4 and the grab samples by site and type at Table 4-5 (Appendix IV).

The published assemblages from Littlehill Bridge (MacGregor and Donnelly 2001) and Gallow Hill [Table 4-6] (Donnelly and MacGregor 2005) offer control references for the analysis of the surface collections. Disc cores were recovered from Area 1. Discoidal core strategies suggest post-Mesolithic activity (ibid, 56-57; cf. Section 5.2.4). There is a table for the characterisation of the assemblage from Littlehill Bridge. Unfortunately, there are discrepancies in this approach where certain artefacts are not given numerical frequencies. Furthermore, the frequency of microliths at Littlehill Bridge does not match the figures shown for that site at Table 4 in the report for Gallow Hill (Donnelly and MacGregor 2005, Table 4). The reason for this discrepancy has not been ascertained. The assemblages from Littlehill Bridge and Gallow Hill were not available for re-appraisal.

MacNeill surface collections from Girvan

	NGR
Principal sites: sampled	
Enoch Farm	NX 204 987
Girvan: Gallow Hill	NX 195 999
Girvan: Golf Course	NX 186 998
Girvan Mains Farm	NX 192 999
Other sites sampled	
Dailly 1	NX 219 996
Girvan 1	NX 209 993
Girvan 2	NX 198 997
Girvan 3	NX 209 998
Girvan 4	NX 2095 9995
Girvan 5	NX 180 995
Other findspots	
Dailly 2	NX 221 994
Girvan 6	NX 210 998
Girvan 7	NX 200 997
Girvan 8	NX 199 997
Girvan 9	NX 223 001
Girvan 10	NX 214 997
Girvan 11	NX 213 996
Girvan 12	NX 201 987

Table 4-4: MacNeill's surface collections showing sites sampled and other locations.

	Cores	Flakes	Blades	Tool forms
Grab samples:				
Daily 1	2		2	2
Enoch Farm	15	16	26	11
Gallow Hill	4	8	21	18
Girvan Golf Course	29		24	38
Girvan Mains Farm	36	5	40	52
Girvan 1	2			1
Girvan 2	3			1
Girvan 3	1		2	
Girvan 4	4		2	
Girvan 5	2		2	
Total	98	29	119	123

Table 4-5: Details of grab samples from principal sites from Table 4-4.

	Gallow Hill	Littlehill Bridge
Natural	1	
Cores	58	11
Flakes	591	140
Blade-like flakes	19	
Blades	148	58
Small Fraction	590	145
Microliths	23	7
Microburins	6	2
Other tool forms	24	3
	1460	366

Table 4-6: Typological analysis of assemblages from Gallow Hill (Donnelly and MacGregor 2005) and Littlehill Bridge (MacGregor and Donnelly 2001).

4.6 Research Transect: inland sites

4.6.1 Loch Doon, Ayrshire

Loch Doon is situated at roughly the midpoint of the research transect with the Ayrshire coast to the east and the Daer Valley, South Lanarkshire to the west. The loch, which was dammed in the 1930s, bestrides the counties of South Ayrshire and Kirkcudbrightshire cutting through the watershed of the Galloway Hills (Affleck 1985, 5; 1985a). Apart from Donald’s Isle (Ansell 1969) at c.200m OD, all of the other sites around Loch Doon are at 210-215m OD (Figure 4.4).

Field survey was undertaken by Ansell in 1968 and artefacts reported to be Mesolithic were collected from four locations in the vicinity of Starr Cottage. There were also other locations at Loch Head where Mesolithic and mixed period assemblages of chert and flint artefacts were recovered. Further work carried out in 1969 resulted in artefacts reported to Mesolithic in character being collected from another location near Starr Cottage, Loch Head and Donald's Isle [Figures 4.4 and 4.5] (Ansell 1968; 1969).

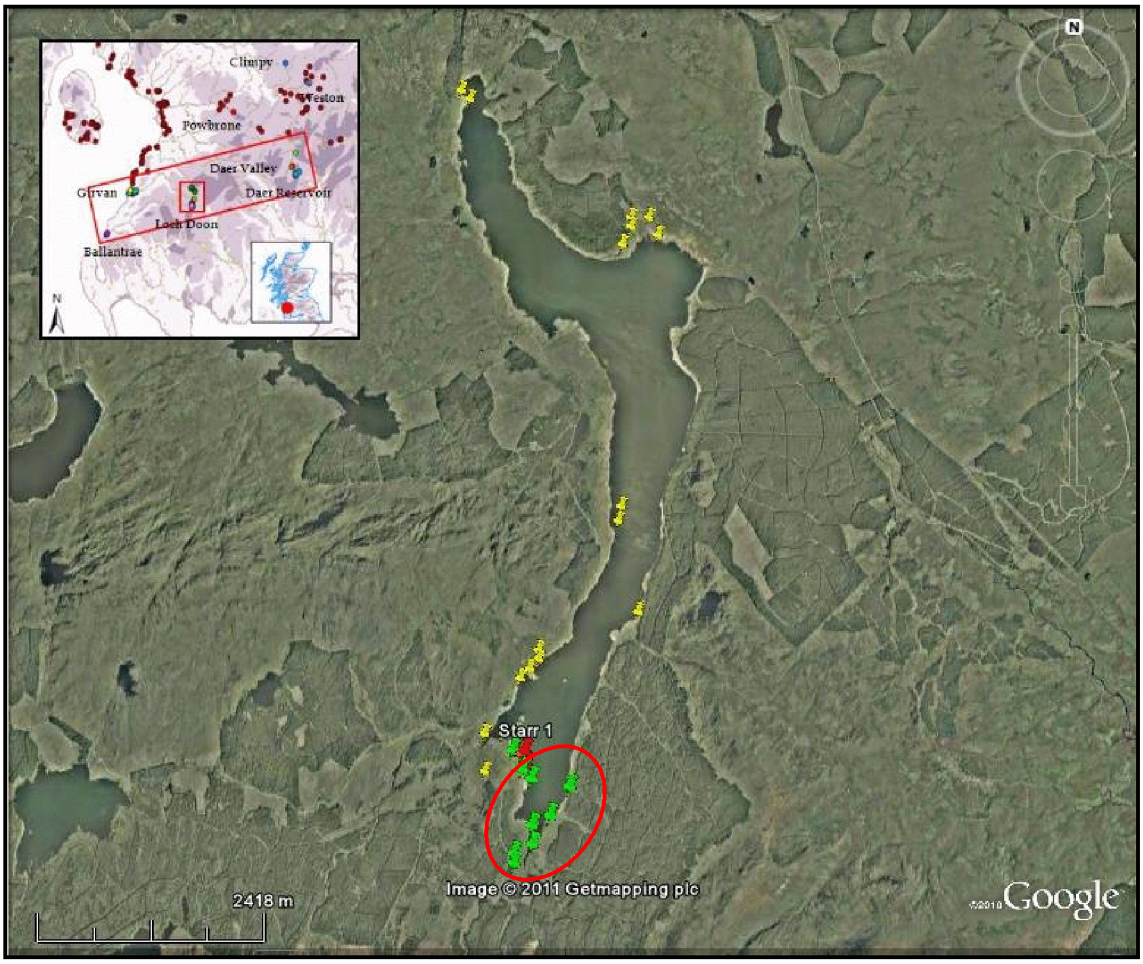

Figure 4.4: Satellite image of Loch Doon showing sites from fieldwork undertaken by Ansell and Affleck. Ansell's surface collections from Loch Head are highlighted. Image from Google Earth © 2011 Getmapping plc.

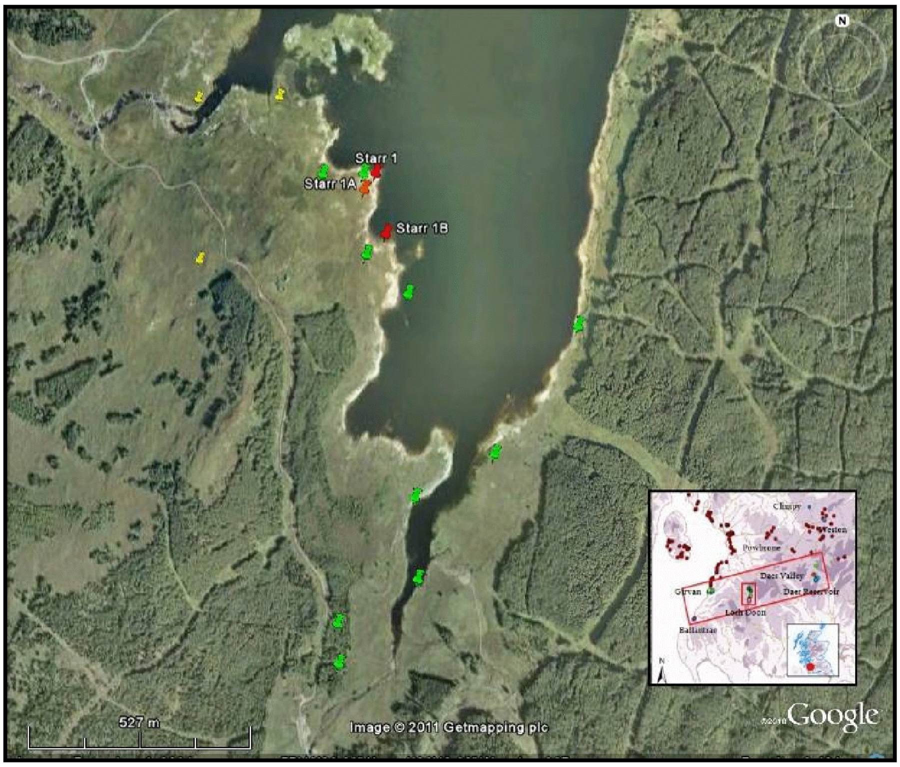

Figure 4.5: Satellite image of the Loch Head showing the sites excavated by Affleck and locations of surface collections. Image from Google Earth © 2011 Getmapping plc.

A research project carried out by Affleck during the 1980s reported the recovery of flint and chert artefacts from 19 locations around the shores of Loch Doon. In addition, there were surface collections at five further sites at Starr. Excavations were subsequently undertaken at Starr 1, Starr 1A and Starr 1B and at Smittons in Kirkcudbrightshire (Affleck 1983; 1984; 1985; 1986; Edwards *et al*. 1983, 9-12). Finlayson (1989) has typologically analysed the microlithic component of the assemblages from the Starr and Smittons sites and carried out use-wear analysis. The Affleck assemblages from field survey and excavation have since been lost (Professor Kevin Edwards pers. comm.). In an attempt to locate these assemblages extensive enquiries were made of those involved in the project, the NMS and museums throughout the counties of south-west and West Central Scotland without any success.

Fortunately, the Ansell assemblages from Loch Head are held at Dumfries Museum (see sites circled at Figure 4.4; Figure 4.5). The predominantly chert and flint artefacts have been conflated and it is not possible to ascertain a locational provenance. The assemblages cannot be unequivocally ascribed to the Mesolithic period. The presence of a typologically Bronze Age slug knife infers a mixed period provenance. However, apart from that artefact the profile of the greater part of the assemblages may relate to Mesolithic occupations.

The assemblages from Loch Head comprise of 1894 artefacts. A typological analysis of all of the artefacts was undertaken. The artefacts chosen for technological analysis (6.39%) concentrated on those artefacts where a Mesolithic provenance was likely, e.g. platform cores, blades and tool forms. 96.77% of tool forms were subject to analysis; cores 47.78% and blades 17.78% (Appendix X). The percentage frequency of blades analysed is less than 20% because the focus for technological analysis was 'true blades' as opposed to 'blade-like flakes' (cf. Section 11).

4.6.2 Daer Valley, South Lanarkshire

Daer Reservoir is situated in the Daer Valley and was dammed in 1956. It is fed by Daer Water which rises in the Lowther Hills at the confluence of a number of small water courses. To the east of the reservoir is Sweetshaw Rig (391m OD) and Types Knowe (448m OD); to the west there is Hitteril Hill (491m OD) and Watchman's Brae (594m OD). Daer Valley is a routeway through the Lowther Hills and forms part of the Southern Upland Way, which is a walking route from coast to coast.

The sites of Daer 84 (Ward 2005b) and Daer 85 (Ward 2004a) at 340m OD (Figures 4.6 and 4.7), approximately 4km north-west of Daer Reservoir, are situated within Tilhill Forest approximately 1km north-east of Coom Rig Hill (424m OD), and due west of Pin Stane Hill (383m OD). The Smithwood Burn, which feeds into Daer Water, runs approximately 100m to the north of the sites within the forest, and at a similar distance to the west is a forestry track. Daer 85 is 50m west of Daer 84. The sites have extensive views of Daer Valley to the north towards the confluence of Potrail Water and Daer Water. To the east there are views across Daer Water and Daer Valley to the ridge of Wintercleugh Fell which rises to 550m OD.

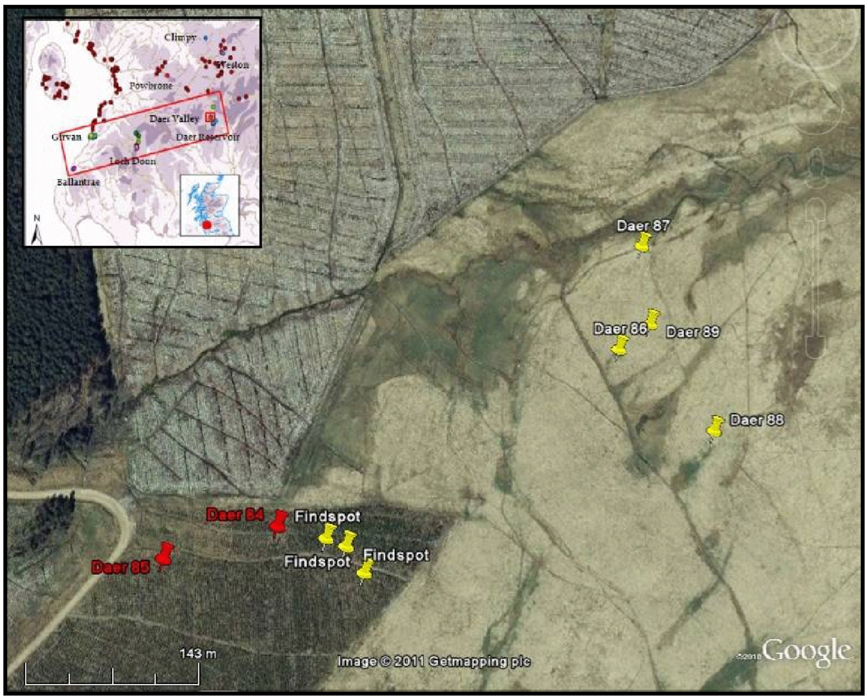

Figure 4.6: Satellite image of Daer Valley showing location of Daer 85 and Daer 84, highlighted in red, and other sites. Image from Google Earth © 2011 Getmapping plc.

There are numerous sites in the Daer Valley from which Mesolithic artefacts have been recovered (Appendix I). The assemblages generally comprise of chert with varying percentage frequencies of flint. During the summer months of 1995 the water level was very low revealing an area of hillside at c.340m OD which would normally be submerged. BAG undertook field survey and several sites were discovered, including two scatter sites: Daer Reservoir 1 and Daer Reservoir 2 (Ward 1995). Further fieldwork revealed many more sites, including the scatter site Daer Reservoir 3 [Figures 4.8 and 4.9] (Ward 2000).

Field survey was also undertaken due to forestry trenching on the north-east facing slopes of Coom Rig (Figure 4.7). Two chert scatter sites, namely Daer 84 and Daer 85 were discovered here. Other stray finds were recorded nearby [Figure 4.6] (Ward 2000).

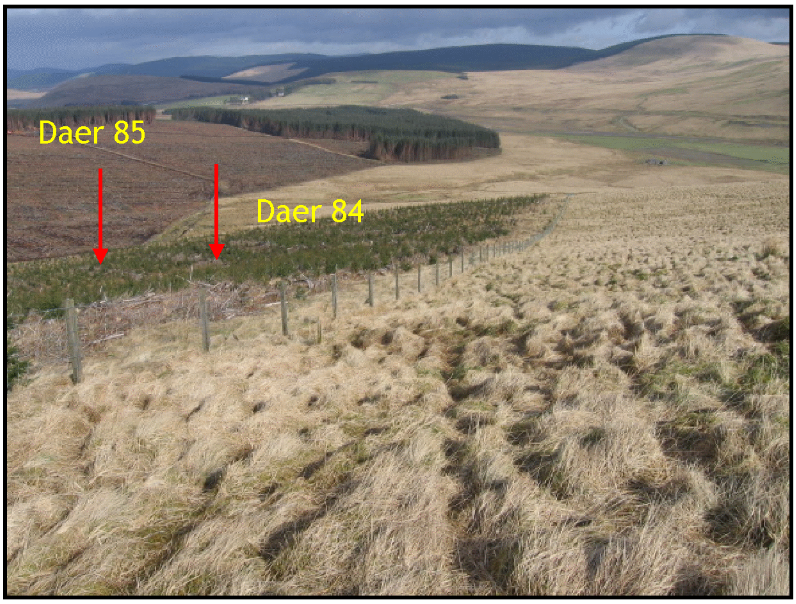

Figure 4.7: Photograph taken from below the summit of Coomb Rig Hill in 2008 looking northeast to Smithwood Burn with approximate locations for Daer 84 and Daer 85. © Chris Wimbush and licensed for use (http://www.geograph.org.uk/photo/719762).

Daer Reservoir 1, Daer Reservoir 2, Daer Reservoir 3, Daer 84 and Daer 85 were subsequently excavated by BAG. During 2010 the BAG *Daer Project* has located four other potential scatter sites (Daer 86; Daer 87; Daer 88; Daer 89) in the vicinity of Daer 84 and Daer 85 [Figure 4.6] (Biggar Archaeology Group 2010). Daer 86 has been excavated and are ongoing as at June 2011 at Daer 89. The mixed period assemblages from Daer 86 and Daer 89, including Mesolithic and Neolithic events (Biggar Archaeology Group 2010a; 2010b; 2010c), can be distinguished from the Mesolithic assemblages from Daer 84 and Daer 85 (chapters 6 and 7).

The assemblages from Daer 84 (Appendix VII) and Daer 85 (Appendix VIII) comprising of 1811 and 1764 artefacts, respectively have been fully analysed. Grab samples from the Daer Reservoir sites, principally focusing on sites 1, 2 and 3, were subject to analysis. This amounted to 322 artefacts; 215 tool forms, 58 cores, 36 blades and 13 flakes (Appendix IX).

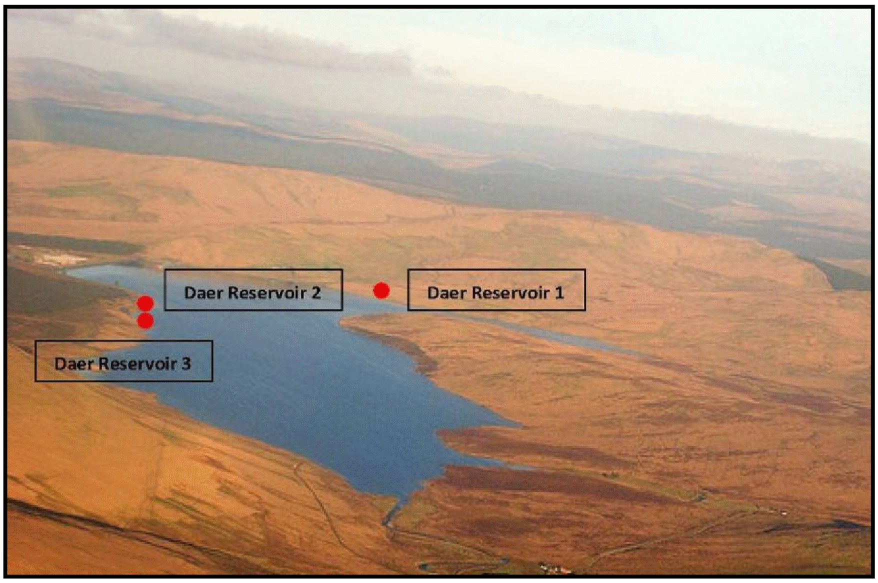

Figure 4.8: Aerial photograph of Daer Reservoir taken from the south-west. The approximate location of the excavated sites is shown. © Alexander Cunningham used with permission.

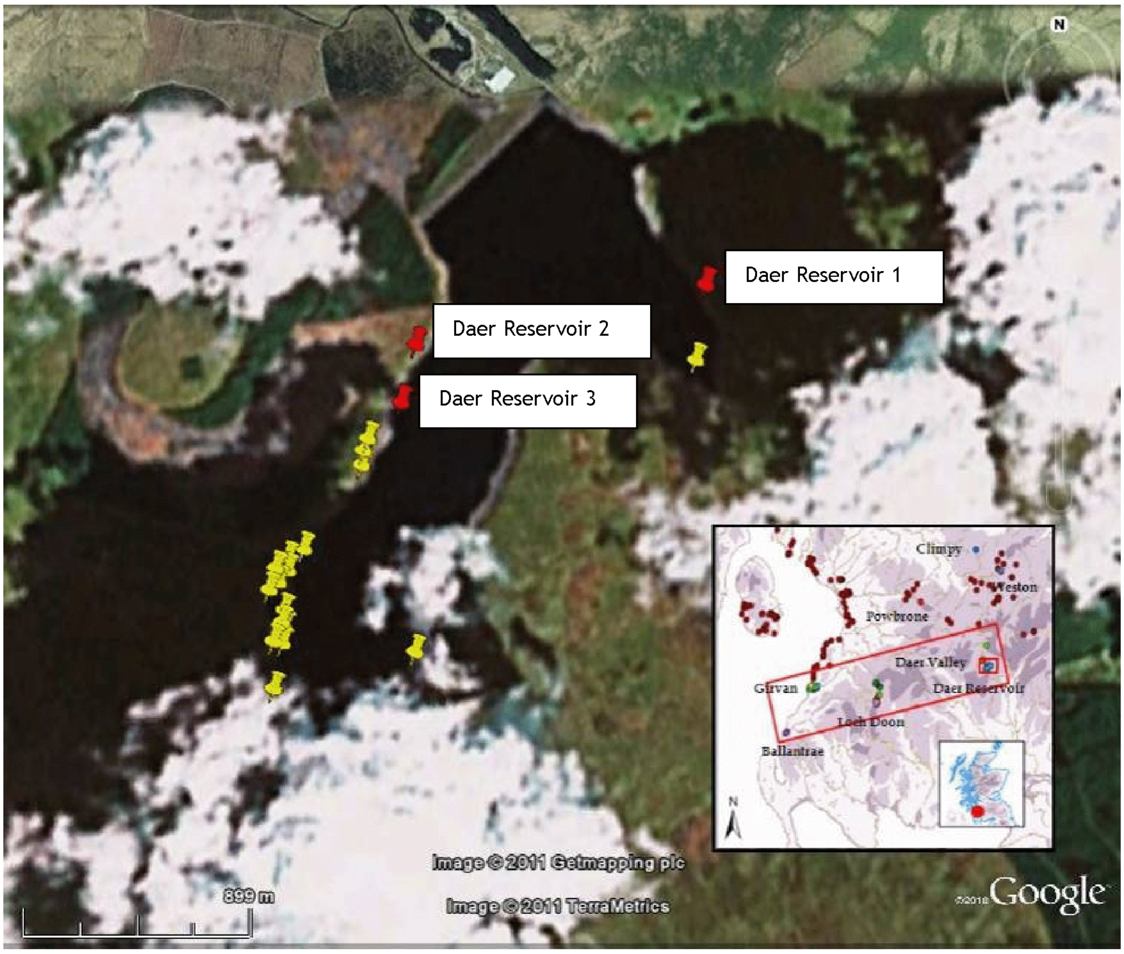

Figure 4.9: Satellite image of Daer Reservoir sites with excavated sites in red. Image from Google Earth © 2011 Getmapping plc.

4.6.3 Assemblages outlying the research transect

The site of Climpy (also known as Hare Hill) has been destroyed by open cast mining. Located at 280m OD it is situated c.800m south-west of the village of Climpy, on level ground 250m due east of Whaup Howe (Figures 4.1; 4.10 and 4.11). The site overlooked the Abbey Burn to the east (Innes *et al.* forthcoming).

The Mesolithic chert scatter site at Climpy was discovered during rescue fieldwork undertaken by GUARD in the late 1990s which involved walkover survey, evaluation and excavation of the Mesolithic lithic scatter and a later banked enclosure (Duncan 1999; Innes *et al.* forthcoming). A full analysis has been undertaken for the chert assemblage from Climpy comprising of 785 artefacts [Appendix V] (Wright 2008).

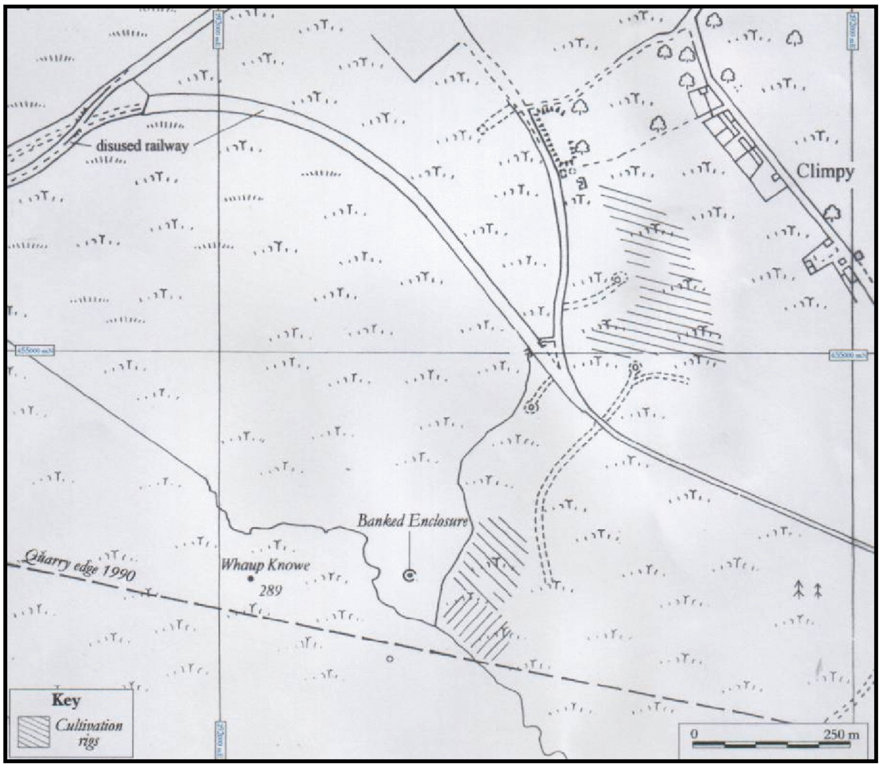

Figure 4.10: Map orientated north showing location of the lithic scatter site and later banked enclosure at Climpy (Duncan 1997 Figure 2; Innes *et al.* forthcoming). © GUARD used with permission.

Figure 4.11: Photograph showing the proximity of the coal extraction quarry edge to the turf-banked enclosure. The site of the lithic scatter was located on the far side of the later banked enclosure. © GUARD used with permission.

The sites at Powbrone Burn in Avondale are situated on river terraces either side of the water course at c.290m OD. The majority of the sites are located on the north terrace along the line of a shooter's track. Sites 7 and 9 are situated on the south terrace [Figure 4.12] (McFadzean 1981; McFadzean *et al*. 1984).

A barbed and tanged arrowhead, typologically attributable to the Bronze Age (after Green 1980), was found on the surface of the shooter's track in 1972. This prompted the extensive survey of the north and south terraces of the Powbrone Burn by the McFadzean family from 1972 to 1981. Test pitting was carried out on the southern terrace from 1979 to 1981 (McFadzean 1981; McFadzean *et al*. 1984). The nature and character of the lithic material recovered suggest that the occupations of Powbrone Burn may be related to the Mesolithic period. The barbed and tanged arrowhead must simply be regarded as a stray find, although Bronze Age material is commonly recovered on Mesolithic sites, e.g. Camais Daraich, Skye (Wickham-Jones and Hardy 2004) and Oliclett, Caithness (Pannett and Baines 2006).

On 20th April 1984 the late Dr Alex Morrison received, on behalf of the University of Glasgow, the lithic assemblages from sites 7 and 9 at Powbrone Burn, Avondale. It is these assemblages comprising of 1471 artefacts that have subject to typological and technological analysis (Appendix XI). Chert is dominant, although there are broadly equal percentage frequencies of flint, quartz and quartzite.

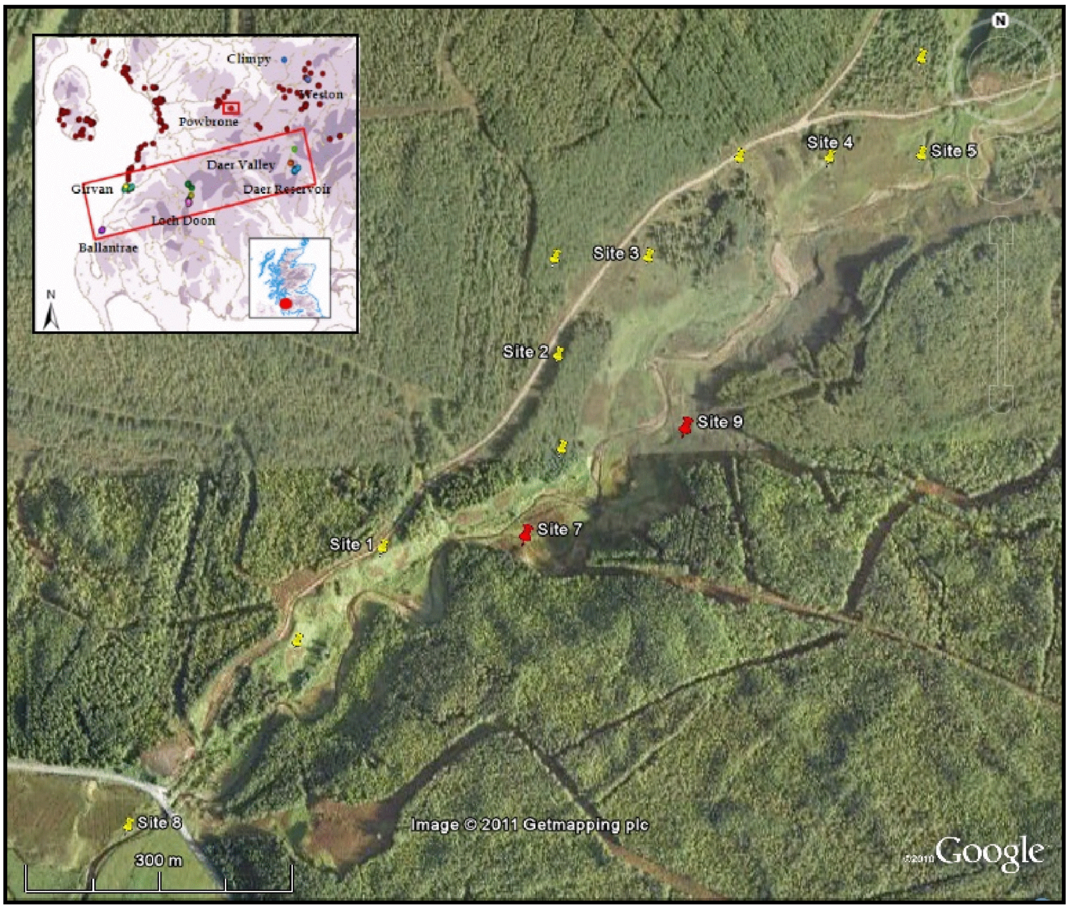

Figure 4.12: Satellite image showing location of sites at Powbrone Burn. Image from Google Earth © 2011 Getmapping plc.

Weston Farm is situated in the South Medwin Valley on the southern slopes of the Pentland Hills, South Lanarkshire at c.250m OD. The sites are found between the North Medwin and South Medwin, north-east of the confluence of these two rivers (Figure 4.13). BAG conducted extensive field survey from mid-1990s culminating in the excavations in 2003-04 (Figure 4.14). More than 45,000, predominantly chert, artefacts have been recovered from Mesolithic, Neolithic and Bronze Age periods of activity (Ward 1995; 1997; 1998; 2000; 2001; 2003; 2006). The assemblage from the excavation was chosen for sampling. The focus for the grab samples was on artefacts where a Mesolithic provenance could reasonably be attributed; comprising of 841 tool forms, 101 cores, 84 blades and 66 flakes (Appendix XII).

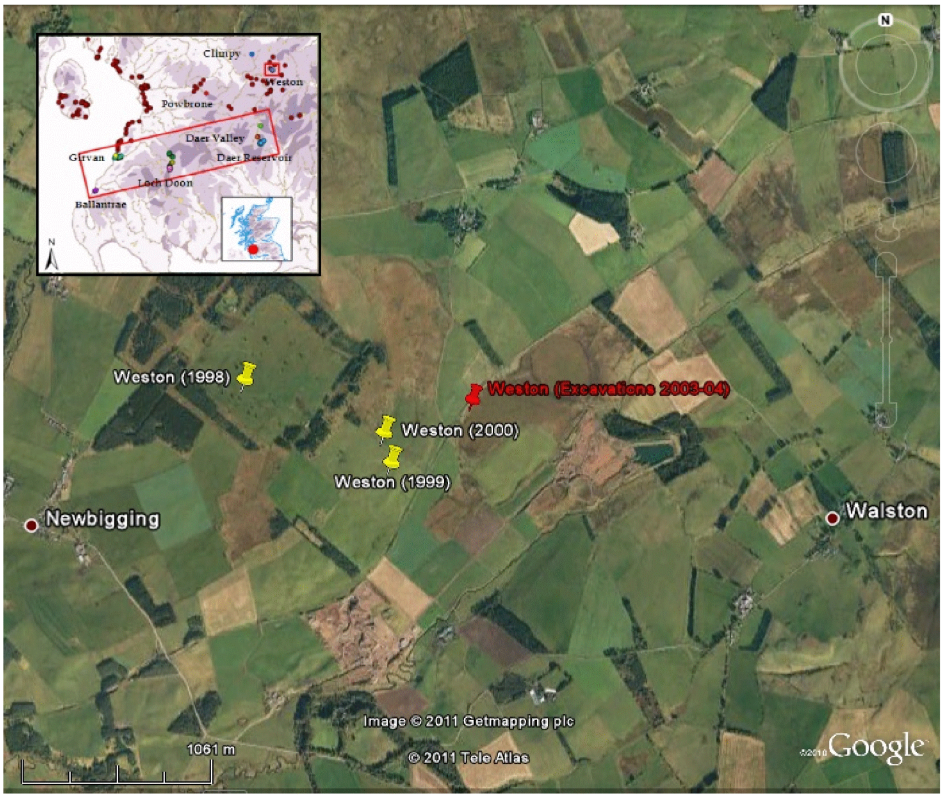

Figure 4.13: Satellite image principal locations of fieldwork at Weston Farm. Image from Google Earth © 2011 Getmapping plc.

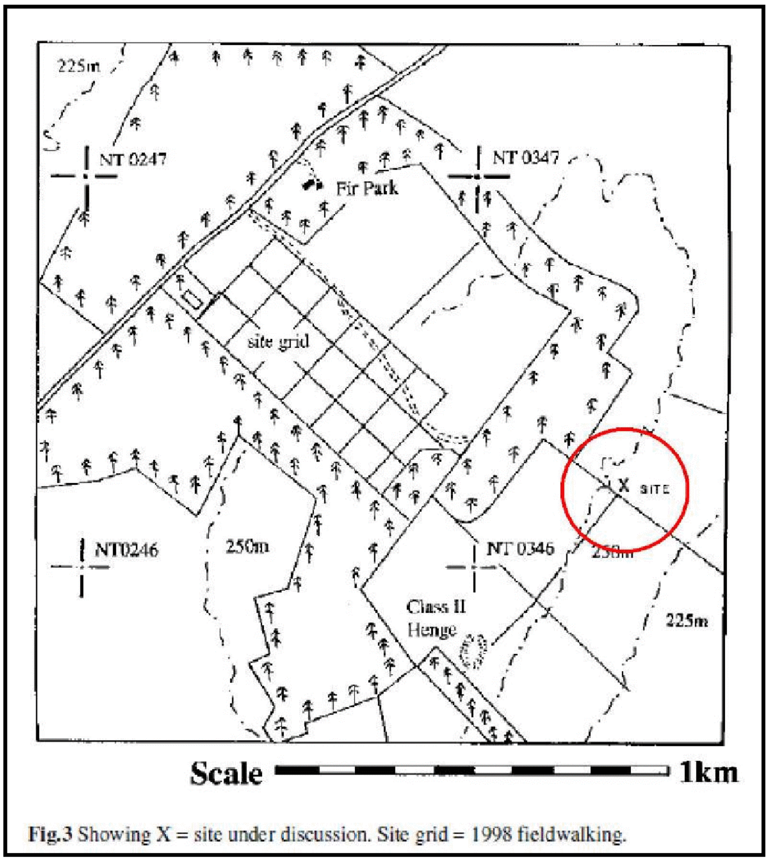

Figure 4.14: Map of Weston Farm showing location of 1998 fieldwalking and 2003-04 excavations (after Ward 2006, Figure 3). © T. Ward used with permission.

4.7 Raw materials as variation

4.7.1 Solid and drift geology

The details of the solid and drift geology have been ascertained using the Geology Digimap® Roam facility at the Edina on-line resource and the associated lexicon [Table 4-7] (University of Edinburgh 2010). The details of the raw materials are also drawn from Geology Digimap® Roam, and other resources (i.e. Gillen 2003; Armstrong *et al*. 1999; British Geological Survey 1993; Greig 1971; McFadzean 1981; Wickham-Jones and Collins 1977; Saville 1994; 2008a).

The ice-flows of the Devensian glaciation are shown at Figure 4.15 (McCabe *et al*. 2007) corresponding to the dominance of glacial till as drift geology in South Ayrshire and South Lanarkshire (Table 4-6), which may, along with alluvium deposits, provide proxy evidence for 'foreign' materials recovered at certain sites.

Solid Geology		
	Formations	**Raw materials**
Ballantrae	Ballantrae Opholite Complex	Chert, mudstone, volcanics, conglomerate
Girvan	Drumyork Flags Formation	Chert, mudstone, sandstone
Loch Doon	Galdenoch; Lanark Group	Chert, quartz, quartzite, chalcedony
Daer Vally	Gala Unit 2	Quartzite, quartz, chert, volcanics, granite, schists
Daer Reservoir	Gala Unit 2; Gala and Hawick Groups	Greywackes, sandstone, mudstone
Climpy	Carboniferous Coal Formation	Chert, quartzite, quartz
Powbrone	Middlefield Conglomerate	Quartz, quartzite, volcanics, greywackes, mudstone
Weston	Clyde Volcanic Plateau; Kinnesswood	Chert, quartz, jasper, fine grained sandstones
Drift Geology		
Ballantrae	Alluvium, marine deposits; glacial till	Beach pebble and riverine flint
Girvan	Alluvium, marine deposits; glacial till	Beach pebble and riverine flint
Loch Doon	Glacial till	
Daer Vally	Glacial till	
Daer Reservoir	Glacial till	
Climpy	Hidden by peat, glacial till in adjacent areas	
Powbrone	Alluvium and glacio-fluvial deposits	Radiolarian chert found in drift gravels
Weston	Glacial till	

Table 4-7: Analysis of the solid and drift geology and highlighting local availability of raw materials.

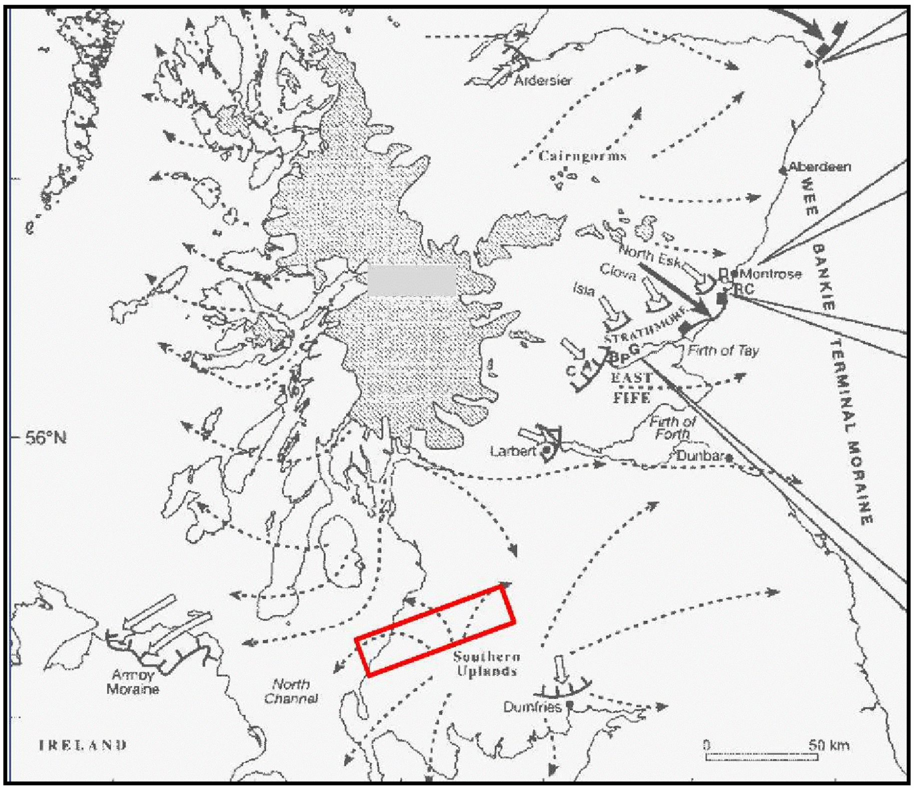

Figure 4.15: Map showing directions of Devensian glacial flows. The shaded area equates to the extent of the Loch Lomond re-advance. Approximate location of research transect is highlighted (after McCabe *et al.* 2007, Figure 1). © Authors and GeoScience World used with permission.

4.7.2 Flint: coastal and inland

Devensian glacial forces eroded the *in situ* flint bearing Cretaceous deposits of Scotland (Saville 1994, 57; 2008a, 1). The extent of the submerged deposits is illustrated [Figure 4.16] (Hall 1991, Figure 3). The nearest Cretaceous sediments to the Ayrshire coast are in band from the sea between Islay and the Mull of Kintyre extending south-west to the mainland of Antrim, Northern Ireland. The gravels of the Buchan Ridge, Aberdeenshire together with the overlying glacial till are a rich resource of flint. The deposits at the Den of Boddam were quarried during the Neolithic period (Saville 1994; 2008a).

Flint found at the coastal and inland sites comprises of two forms from secondary resources. Firstly, beach pebble flint is identifiable with a pitted/battered cortical surface. Secondly, riverine flint will have eroded out of glacial till. The cortical surface will have been originally either smooth/hard or smooth/chalky. In both instances the cortical surface will present with water-rolled attributes.

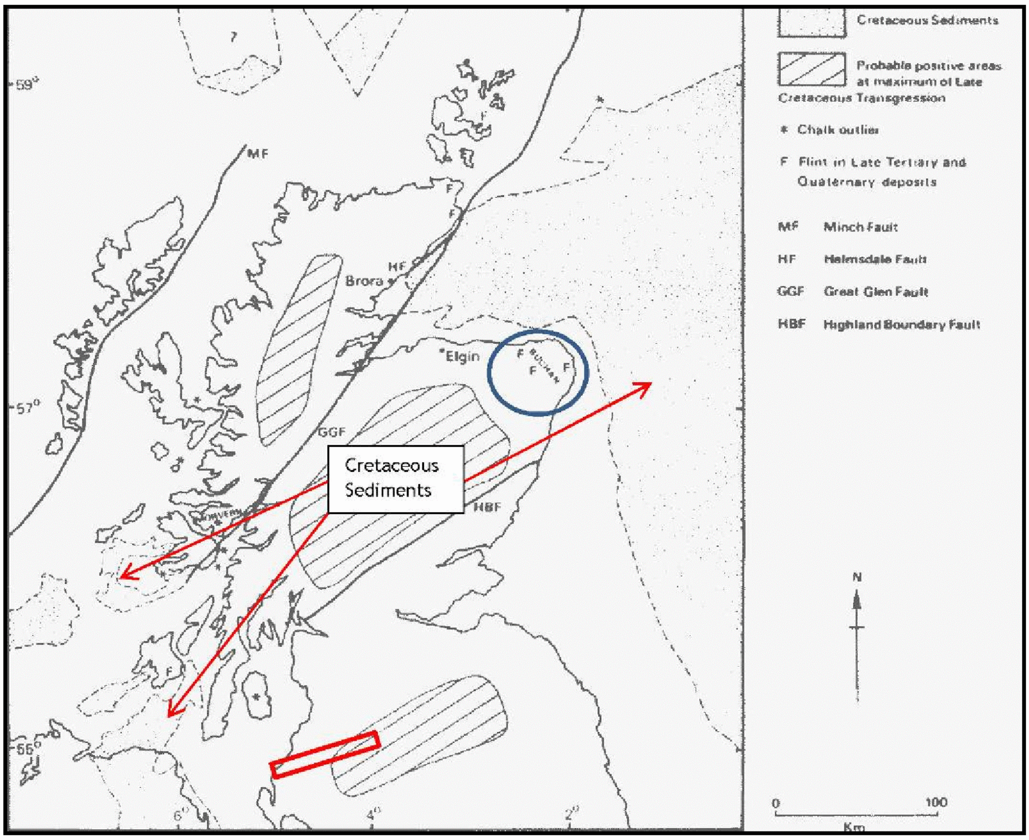

Figure 4.16: Map showing the offshore Cretaceous sediments (stippled) in Scotland. The flint bearing gravels of the Buchan Ridge and the Den of Boddam are highlighted [circled in blue]. (after Hall 1991, Figure 3). © Author and RSE Scotland Foundation used with permission.

These offshore Cretaceous sediments are directly responsible for the redeposition of beach pebble flint on many of the beaches of Scotland, including the Ayrshire coast (Wickham-Jones and Collins 1977; Saville 1994). The nature of the cortical evidence of flint artefacts, heavily pitted and battered, from Ballantrae and Girvan speaks to the utilisation of beach resources during the Mesolithic period. The water-rolled cortical surface of other flint artefacts attests to the presence of glacio-fluvial and riverine deposits; presumably present in the glacial till and subjected to later alluvial taphonomic processes. Saville (2008a, 1) has reported that beach flint usually comprises of small pebbles with pronounced variations in quality. The artefactual evidence from Ballantrae and Girvan supports the size dimensions, although the quality is invariably good and homogenous (chapter 5).

The flint found at inland sites may have originated from coastal resources, e.g. Finlayson (1989) has suggested that the flint recovered from sites in and around

Loch Doon was brought to these locations by hunter-gatherers. Flint may also have been available locally in riverine locations.

4.7.3 Chert

Generally, there are two main types of chert deposit. Firstly, ovoid or semi-circular spherical nodular chert occurs adjacent to, or parallel with layers of water marine carbonate rocks and limestones. Individual nodules and layers of nodules are common within limestone formations. Secondly, bedded cherts may be found as strata within volcanic formations and interbedded with layers of shale. Chert may also be found in sandstone formations. The remains of siliceous organisms such as diatoms and radiolarians form the majority of cherts (Shepherd 1972, 35; Gillen 2003; University of Edinburgh 2010).

Ordovician radiolarian cherts are abundant in the Southern Uplands (Owen *et al.* 1999; 1999a) and poorer quality Carboniferous cherts are common in Central Lanarkshire (Gillen 2003). The ice-flows suggest that Radiolarian chert from the Southern Uplands will also be found in glacial tills and riverine locations of South Ayrshire and South Lanarkshire (Figure 4.15).

A chert quarry where extraction may have occurred during the Mesolithic period was discovered at Broughton, South Lanarkshire in the vicinity of the Biggar Gap (Biggar Archaeology Group 2010). Chert quarries representing small scale extraction events during the Mesolithic period, based on blade debitage products, are known in the Upper Tweed Valley (Warren 2007, 146). There is no evidence for the use of quarried chert in the assemblages looked at in this thesis. There has been no systematic survey for quarries within the research area. The chert utilised is from secondary sources.

Geologists have commenced work on the defining the chemical signature of cherts across southern Scotland [Figure 4.17] (Armstrong *et al.* 1999; Owen *et al.* 1999; 1999a), however, the geographic locations of investigation is not sufficiently fine-grained to be of anything other than only passing interest to archaeologists as yet. Apart from Radiolarian and Carboniferous cherts and flint, there are numerous other knappable raw materials available which are set out in the previous chapter at Table 2-5.

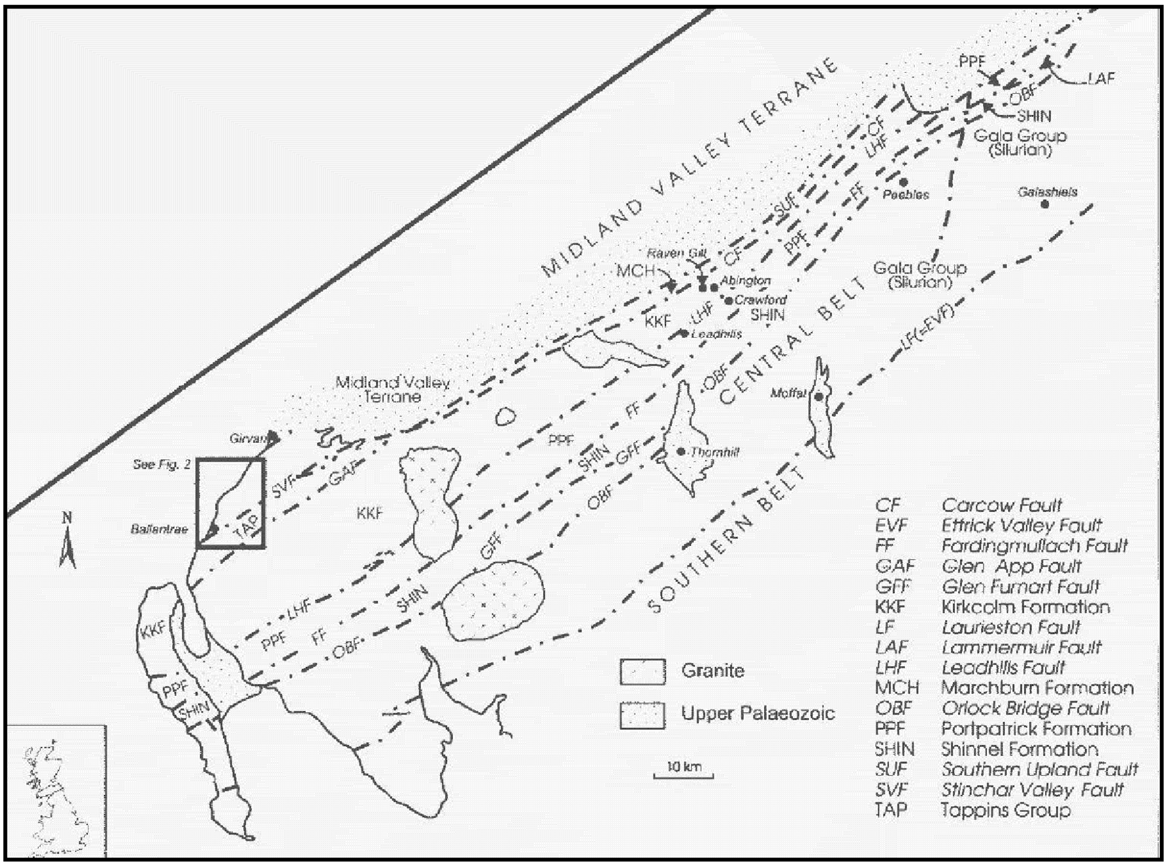

Figure 4.17: Map showing locations for investigation into the chemical signature of cherts. Highlighted box refers to the Ballantrae Ophiolite Complex [see Figure 4.18] (Armstrong *et al.* 1999, Figure 1). © Authors and GeoScience World used with permission.

4.7.4 Ballantrae and Girvan

The availability of chert at Ballantrae and Girvan has long been known (e.g. Lacaille 1937, 61-66). It is found within the Ballantrae Ophiolite Complex [Figure 4.18] and is of predominantly green and red hues (Armstrong *et al.*1999). Very few chert artefacts are found within the collections and excavated assemblages from Ballantrae and Girvan (chapter 5), and discussed in chapter 8.

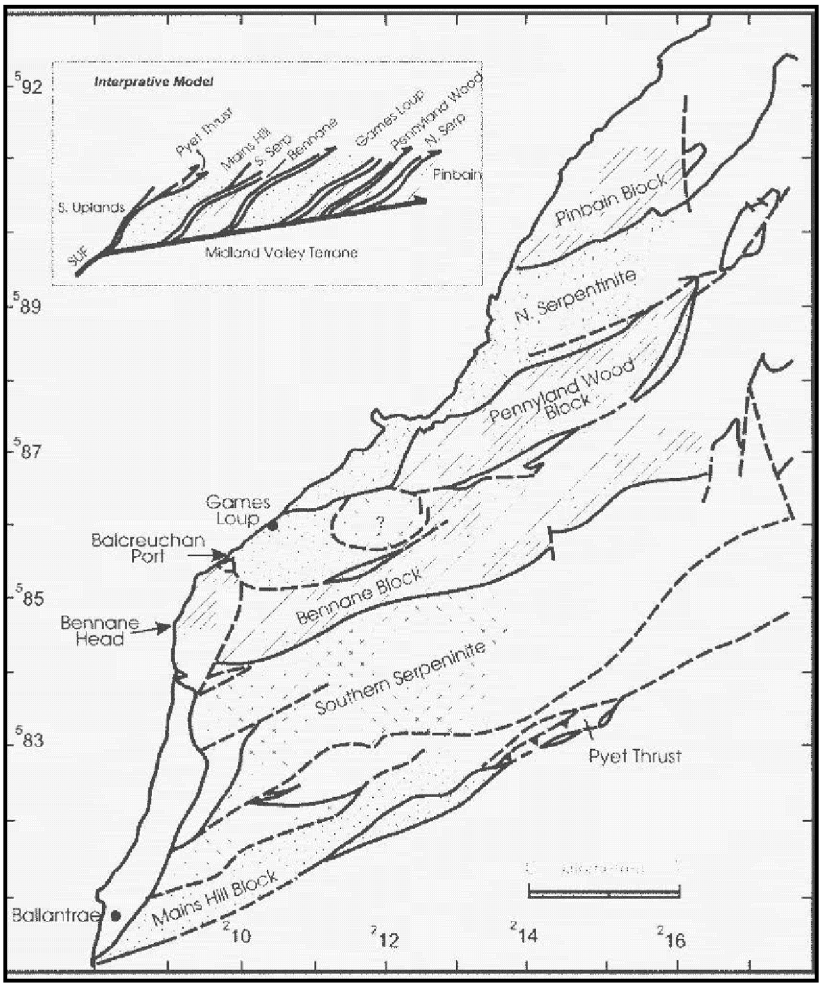

Figure 4.18: Tectonostratigraphic reconstruction of the Ballantrae Ophiolite Complex which includes beds of Arenig period chert (Armstrong *et al.* 1999, Figure 2). © Authors and GeoScience World used with permission.

4.7.5 Daer Valley

BAG has undertaken extensive fieldwalking, survey and excavation in the Daer Valley intermittently for more than 15 years. Ward (2004a; Biggar Archaeology Group 2010c) advises that chert is not locally available in the Daer Valley, although it may be found in the Upper Clyde Valley. The British Geological Survey (1993, 11) contradicts this and notes that the conglomerates within the Gala Group near Pin Stane Hill comprise of variable occurrences of rounded clasts of chert along with other raw materials. Daer 84 and Daer 85 are approximately 500m west of the summit (383m OD). The formations are Silurian, although Ordovician volcanic rocks have been recorded at Pin Stane Hill (Greig 1971, 39).

There are no references at either Geology Roam® (University of Edinburgh 2010), or in the British Geological Survey (1993) for chert in the vicinity of Daer Reservoir. The chert found in the collections and assemblages from Daer Reservoir is radiolarian, and can be distinguished from the chert recovered from Daer 84 and Daer 85 (chapter 6). It has either been brought to these locations in a reduced state, or harvested from redeposited resources as a result of glacio-fluvial action.

4.7.6 Loch Doon, Climpy, Powbrone and Weston

The non-flint artefacts found in the collections and excavations from Loch Doon, Climpy, Powbrone and Weston have been fashioned from raw materials found locally within the solid geology of these areas.

Carboniferous chert is noted at Climpy as well as 'imported' or 'foreign' better quality radiolarian chert (chapter 6). Carboniferous chert has been recorded at other sites in Central Lanarkshire, i.e. Woodend Loch (Davidson *et al*. 1949) and Glentaggart (Ballin and Johnson 2005).

4.8 Reduction strategies as variation

The artefacts from each of the collections and excavated assemblages have evidence for platform and bipolar reduction strategies. The former strategy is dominant (chapters 5, 6 and 7). It must be borne in mind that a bipolar reduction strategy was only recognised as a conceptual scheme during the 1970s. Broadbent (1979) considered the historiography of the misidentification of bipolar cores in assemblages from Northern Sweden. It may be argued that Callahan's (1987) work on lithic assemblages from Middle Sweden during the Mesolithic and Neolithic periods is the first book which principally focuses on bipolar strategies. This section is a brief overview of certain issues relating to primary technologies and the technological analysis of artefacts.

Platform reduction generally requires the removal of a nodule opening flake to create a flat simple or plain platform using a hammer. Conversely, the striking platform may occur naturally (Zetterlund 1990, 72). Removals would then be struck from the sides of the core to ensure that the platform angle was maintained at less than 90° to facilitate the subsequent detachment of blanks. The core would be struck with either a hammerstone, or a billet made from antler or wood, i.e. direct percussion. Indirect percussion involves the use of a punch and the intermediary between the core and the hammer. The core may be hand-held or anvil supported, and the edge may be prepared by the scrubbing or trimming the platform prior to the removal of blanks (Whittaker 1994, 85-93). The creation of new platform(s), generally either opposable, or cross or multi-directional indicates a strategy of core re-orientation (Andrefsky 1998, 140), which is particularly relevant in the construction of core biographies and core stage analysis. The use of platform cores is associated with flake and blade industries (e.g. Wickham-Jones 1990; Finlay *et al.* 2000; Donnelly and MacGregor 2005 and others).

Bipolar reduction is the technique by which a nodule is placed on an anvil and struck with a hammer which may be of varying hardness. The proximal end may have a pronounced or diffuse bulb of percussion. The shock of the strike will reverberate back from the anvil resulting in a scar to the distal end. If a piece has been orientated through 90° then there will be two sets of opposable scars (Knight 1991, 63). The strike would be parallel to the vertical axis of the nodule, i.e. pieces would be detached at or close to 90° (Kuijt *et al.* 1995, 117). The core or nodule should be stable. The object may be wrapped to avoid fragment or shatter flying off and potentially causing injury to the knapper. The wrapping of the object may increase the length of the flake due to the pressure from the fingers in securing the wrapping (Knight 1991, 57-58). Experimental replication studies have determined that bipolar reduction strategies not only generate a vast amount of shatter and non-orientable debitage when compared to the hand held core reduction method, but also it necessitates more hammerstone strikes to create exploitable removals. Bipolar reduction may be adopted because of the size of the raw material which may be difficult to reduce by other methods (Kuijt *et al.* 1995, 117-118).

Bipolar cores are not to be confused with *pièces esquilées* (Kuijt *et al.* 1995, 119). Cores should not have a bulb of percussion or any trace of an initial ventral scar on either face. There should be indications of primary removals from one or more surfaces. The scars from flake removals should be evident throughout the full surface from which it has been detached (Hayden 1981, 3). It should also be possible to distinguish the order of the removals; if this cannot be achieved then the piece should be classified as a chunk (Wickham-Jones 2004a, 69).

Lindgren (2003, 180-181) draws a distinction in the utilisation of quartz by reduction strategy in assemblages from Eastern Middle Sweden. The bipolar reduction of quartz generally produced flakes which were not modified for use. In contrast, there was a higher percentage frequency of secondary modification to platform quartz flakes. Evidence from *SHMP* determined that the bipolar and platform reduction of quartz was coeval, and often used to prolong the working life of platform cores. The bipolar technique was also used to facilitate the knapping of small pieces of flint (Finlay *et al.* 2000, 557-558). The interaction of these two strategies and their relationship to raw materials feature in chapters 5 and 6.

There appears to be some dispute concerning the function of the *pièces esquilées* (Hayden 1981, 3; Table 4-8). *Pièces esquilées* were recovered from Daer 84 and Daer 85 (cf. chapter 6).

• *Pièces esquilées* have been described as wedges to remove splinters from antler to make into tools. To counter this it has been proposed that primary flakes would serve the purpose better. From experimental studies, it was found that wedges used on bone and hard wood were too blunt which caused shattering. The experiment was not carried on antler. Secondly, it has been put forward that the *pièces esquilées* would be better applied to the splitting of green bone from cattle. The bone would be scored, the wedge placed on the line scored and tapped gently. The bone generally fractured along the score line. If the bone was hit with a hammerstone then it was noted that the split in the bone was not so successful in following the intended fracture line.
• A case was cited from Chiapas, Mexico where the bones of deer were the preferred raw material from which to make needles and corn huskers. The *pièces esquilées* were found within the same contexts and closely associated with arrowheads. Other experimental studies on bones from deer and kangaroo proved to be less successful (*ibid*).
• In contrast Migal (1987, 14-18) found that *pièces esquilées* were proficient in processing wood, antler and bone. Multiple tools were required coupled with a substantial number of strikes which varied with the raw material. Hide could be efficiently cut into straps. The tool set of wedges together with a soft hammerstone and anvil demonstrated that the processing of wood was not as good as with the hard hammerstone. However, the working of bone and antler was perfectly acceptable, and was better for the precise cutting of hide. The profile of the *pièces esquilées*, referring to the experimental replications undertaken by Migal (1987, 12-18), suggests the use of a soft hammer coupled with a hard anvil.

Table 4-8: Discussions from experimental archaeology on the function of *pièces esquilées*.

Investigations into the secondary technologies (cf. chapters 6 and 7) will consist of establishing common differences and variations in:

- Raw materials used for secondary modification;
- Diversity of retouched artefacts;
- Forms of retouch used in secondary modification;
- Types of microliths;
- Forms of scrapers; and
- Other tool forms.

4.9 Summary

This chapter has put forward a research framework incorporating a robust methodological schema for the fine-grained technological analysis of artefacts which is complimentary to the theoretical underpinning of my research. It has explained the rationale for a research transect, and the choice of lithic assemblages/collections for analysis to consider and compare variation at intra-site, inter-site and intra-regional levels of enquiry to construct a regional profile of the Mesolithic period in West Central Scotland.

The methodology and sampling strategy are sufficiently robust to counteract the inherent biases in surface collections and excavated assemblages to achieve the stated aims and objectives of the thesis.

Chapter 5: Lithic practice for events at Ballantrae and Girvan, South Ayrshire during the Mesolithic period

5.1 Introduction

This chapter considers the characterisation of the primary and secondary technologies of the coastal collections from Ballantrae and Girvan. The establishment of intra-site variability of primary and secondary technologies will permit a comparison of technological practice between Ballantrae and Girvan.

The assemblages from the fieldwork undertaken in Girvan by GUARD at Littlehill Bridge (MacGregor and Donnelly 2001) and Gallow Hill (Donnelly and MacGregor 2005) provide control references to the technological analysis of the sampled collections. Areas 1 and 2 of the excavations at Gallow Hill equates to MacNeill's surface collections of 286 artefacts from Girvan 2, Girvan 7 and Girvan 8. Area 4 is comparable to Girvan Mains Farm, where MacNeill collected 2558 artefacts (Figure 4.3). The artefacts from Area 4 were recovered from fieldwalking (Donnelly and MacGregor 2005).

The assemblage from Gallow Hill Area 1, which incorporates the structural evidence, has been interpreted as a palimpsest of small-scale Late Mesolithic and later activity. Area 2, in the vicinity of a Mesolithic pit group, is similarly a palimpsest although the assemblage is predominantly Late Mesolithic in character. It is suggested that the activity in this location focused on the production of blades for microlith manufacture and potentially other tasks. Area 4 is recorded as major area of Mesolithic activity. The surface collections are said to be comparable to those collected by MacNeill (Donnelly and MacGregor 2005, 56-58), to which my analysis must concur. The assemblage from Littlehill Bridge has been classified as a site for blade production (MacGregor and Donnelly 2001, 10). The nature of the occupations/activities at Girvan and Ballantrae are discussed further in Chapter 8.

5.2 Primary Technology

5.2.1 Raw material

Flint dominates the surface collections from Ballantrae (Lacaille 1945, 84) and Girvan. 98.11% of the artefacts from the sampled collections from Ballantrae are flint; Girvan 99.46% (Table 5-1). These percentage frequencies are comparable to the percentage frequencies of flint from the assemblages from Littlehill Bridge at 94.54% (MacGregor and Donnelly 2001, 6), and Gallow Hill 92.26% (Donnelly and MacGregor 2005, 48. The Littlehill Bridge assemblage comprised of 366 artefacts, 200 from excavations and the balance recovered from bulk samples (MacGregor and Donnelly 2001, 6). The 1460 artefacts from Gallow Hill were recovered during fieldwalking, test-pitting and excavation. The majority of the artefacts (79.79%) were recovered from Area 2 (Donnelly and MacGregor 2005, 47), of which 73.30% is excavated material (*ibid*, 56). Flint accounts for 99.31% of the Edgar collection from Ballantrae (Lacaille 1945, Table 1). The data suggests that the sample chosen for analysis is representative and indicates the preference for the utilisation of flint on the Ayrshire coast. Table 5-2 shows the number of artefacts in the grab samples from each site. The Edgar and Muirfield collections at the NMS and Hunterian, respectively do not distinguish between different collections locations. Maps showing the site locations for Ballantrae and Girvan may be found at Figures 4.2 and 4.3.

Raw Material				
	Ballantrae	**%**	**Girvan**	**%**
Flint	673	98.11%	367	99.46%
Chert	7	1.02%		
Agate	4	0.58%	1	0.27%
Chalcedony	2	0.29%		
Quartz			1	0.27%
	686		369	
Colour of flint				
Brown	80	18.87%	14	9.86%
Grey	343	80.90%	128	90.14%
Pink	1	0.23%		
	424		142	

Table 5-1: Numerical and percentage frequency of raw materials in the sampled assemblages from Ballantrae and Girvan.

Ballantrae		Girvan	
Gray site 4	25	Dailly 1	6
Gray site 4N	13	Enoch Farm	68
Gray site 5	191	Gallow Hill	51
Gray site 5W	14	Girvan Golf Course	91
MacNeill NX087 818	9	Girvan Mains Farm	133
		Girvan 1	3
Muirfield	192	Girvan 2	4
Edgar	242	Girvan 3	3
		Girvan 4	6
		Girvan 5	4
Total	686		369

Table 5-2: Site location of artefacts from Table 5-1, where known.

It is not possible to differentiate the flint from Ballantrae and Girvan by colour given the common differences in the percentage frequencies of greyish and brown hues (Table 5-1). A relatively high proportion of the greyish flint presents with a mottled greyish/white appearance which may represent a primary stage in the patination process (see also Lacaille 1945, 86). Overall a higher incidence of brownish hues in the sampled collections is recorded at Ballantrae, although this may be a statistical anomaly. For example, the evidence from fresh cores from Ballantrae shows 8.16% have brownish hues; Girvan 8.33%. A pink flint inner blade was recovered by Gray at Site 5, Ballantrae. The colour of this artefact is anomalous to other flint artefacts from Ballantrae and Girvan, and may indicate the movement of flint from elsewhere other than that part of the Ayrshire coast.

The cortical surface of artefacts is potentially more informative in considering the procurement stage of the *chaîne opératoire*. 45.81% of the artefacts from Ballantrae with cortex have a pitted/battered surface; Girvan 53.45%. The data from cores statistically equate at 51.96% for Ballantrae and 53.17% for Girvan. These attributes suggest flint pebbles were collected from the shoreline at both geographic locations. An original smooth/chalky surface, subsequently rolled hard/smooth, is more frequent at Ballantrae 31.28%; Girvan 12.07%. Artefacts with a smooth/hard rolled surface without a chalky attribute have a greater occurrence at Girvan 34.48%; Ballantrae 22.91% (Table 5-3). This may indicate the collection of flint pebbles from primary riverine sources such as the Water of Girvan at Girvan and the River Stinchar at Ballantrae, or secondary water courses. The utilisation of shoreline and other resources for the procurement of flint pebbles broadly equate at Ballantrae and Girvan (Table 5-3; Figure 5.1), although material from glacial moraines may have been more abundant in and around Ballantrae. The water-rolled nature of the cortex on flint artefacts from Gallow Hill is noted (Donnelly and MacGregor 2005, 50), although no distinction in the attributes is offered and all of the flint is said to originate from beach pebbles.

	Total	Smooth/chalky	Smooth/hard	Pitted	Battered
Ballantrae					
Cores	102	22	27	25	28
Blades	40	17	7	13	3
Flakes	37	17	7	9	4
	179	56	41	47	35
		31.28%	22.91%	26.26%	19.55%
Girvan					
Cores	79	9	28	13	29
Blades	29	2	12	6	9
Flakes	8	3		1	4
	116	14	40	20	42
		12.07%	34.48%	17.24%	36.21%

Table 5-3: Numerical and percentage frequency of cores, blades and flakes by original cortical surface.

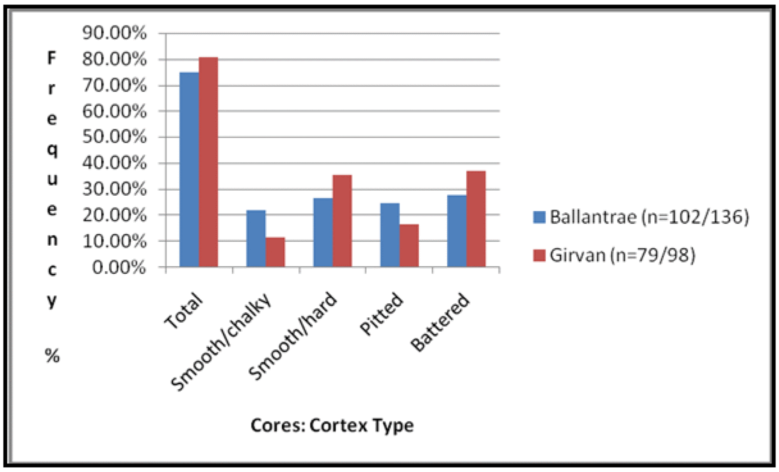

Figure 5.1: Numerical frequency of cores, blades and flakes by original cortical surface.

5.2.2 Character of the collections

The character of the sampled collections is shown at Table 5-4. The surface collections from Ballantrae and Girvan contain artefacts which, following Green

(1980), can typologically be ascribed to the Neolithic and Bronze Age, namely lozenge and barbed and tanged arrowheads. The general profile of the character of the collections may be said to relate to Mesolithic occupations, although there remains the potential for the presence of later debitage. Post-Mesolithic artefacts were recorded at Gallow Hill Areas 1 and 2 (see also Donnelly and MacGregor 2005, 56).

A general overview of the assemblages from Ballantrae and Girvan reveal a significant population of primary and secondary flakes. Generally, there will only be a maximum of two primary flakes from each core. This may imply that following the collection of flint pebbles, primary knapping was undertaken at secondary locations to produce serviceable cores. This may also signify different temporal events, although the number of primary blanks in the sampled assemblages does not reflect this (Table 5-4). The sampling strategy focused on blades and generally those flakes with edge damage.

	Ballantrae	%	Girvan	%
Tested split pebbles	1	0.15%	0	
Chunks	2	0.29%	0	
Cores	136	19.83%	98	26.56%
Flakes	81	11.81%	29	7.86%
Primary	3		0	
Secondary	34		8	
Tertiary	44		21	
Primary regular	0		0	
Primary irregular	3		0	
Secondary regular	11		3	
Secondary irregular	23		5	
Tertiary regular	17		12	
Tertiary irregular	27		9	
Blades	212	30.90%	119	32.25%
Primary	2		2	
Secondary	38		27	
Tertiary	172		90	
Primary regular	0		1	
Primary irregular	2		1	
Secondary regular	25		24	
Secondary irregular	13		3	
Tertiary regular	138		69	
Tertiary irregular	34		21	
Small Fraction	5	0.73%		
Modified	249	36.29%	123	33.33%
Total	686	100.00%	369	100.00%

Table 5-4: Character of the sampled collections from Ballantrae and Girvan.

5.2.3 Condition of the collections

Fresh artefacts are most common at Ballantrae (62.83%) followed by patinated pieces (33.24%). The reverse situation is noted at Girvan (Table 5-5; Figure 5.2) suggesting that the majority of the artefacts from Ballantrae were recovered from locations where there has been either less ground disturbance or different soil conditions. The percentage frequencies of burnt pieces statistically equate. Only three artefacts from the Ballantrae sampled assemblage have water-rolled attributes. Coles (1963, 73) noted the paucity of rolled pieces from Ballantrae. High frequencies of patination are inferred in the assemblages from Gallow Hill (Donnelly and MacGregor 2005, 50). Given the high levels of patination it is possible that chert is under-represented.

	Total	Fresh	%	Patinated	%	Burnt	%	Rolled	%
Ballantrae									
Tested split pebbles	1	1	100%						
Chunks	2	2	100%						
Cores	136	102	75.00%	22	16.18%	11	8.09%	1	0.73%
Flakes	81	49	60.49%	28	34.57%	4	4.94%		
Blades	212	140	66.04%	70	33.02%	2	0.94%		
Small Fraction	5	5	100%						
Modified	249	132	53.02%	108	43.37%	7	2.81%	2	0.80%
	686	431	62.83%	228	33.24%	24	3.50%	3	0.43%
Girvan									
Cores	98	39	39.80%	51	52.04%	8	8.16%		
Flakes	29	7	24.14%	21	72.41%	1	3.45%		
Blades	119	47	39.50%	70	58.82%	2	1.68%		
Modified	123	50	40.65%	72	58.54%	1	0.81%		
	369	143	38.75%	214	57.98%	12	3.25%		

Table 5-5: Condition of the sampled collections from Ballantrae and Girvan.

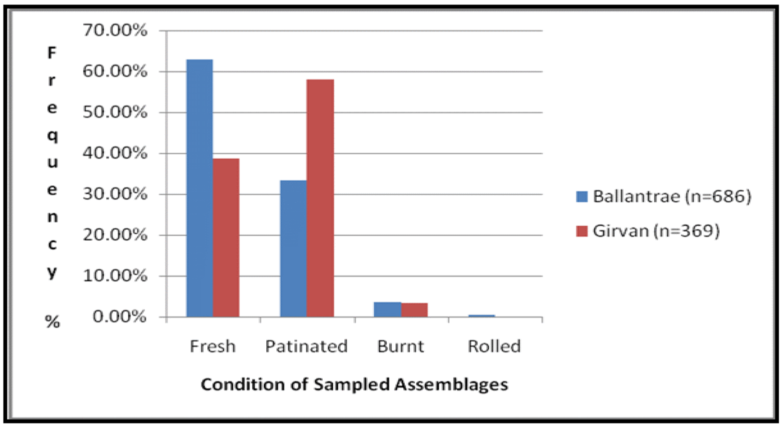

Figure 5.2: Percentage frequencies of sampled collections by condition.

5.2.3.1 Ballantrae

Disregarding the data from MacNeill because of the small number of pieces subjected to analysis, the highest incidence of patination is noted on the artefacts collected by Edgar in the transect from Downan Burn to Laggan (Figure 5.3). Although lower, the percentage frequency of patination of Gray's artefacts is relatively high. This suggests that the Edgar and Gray collections suffered either considerable exposure over time to plough soil disturbance, or it may reflect the type of soil matrix from which artefacts were recovered, e.g. a predominantly sand matrix will produce white cortication. This process refers to the change of the original inner colour of raw material to white, which results from the loss of water from the internal crystallite structure of siliceous materials. Flint can be distinguished from chert because it is prone to lose water when exposed to the atmosphere which chert generally does not (Shepherd 1972, 33-36).

The lowest incidence of patination is noted on the Muirfield pieces from Greddans Cottage [also referred to as Craddock Cottage] (Figure 5.3). As pointed out by Edgar in a letter to Callander dated 18th July 1935 (National Museum of Scotland Edgar Archive), the recovery of the artefacts was associated with garden trenching at the cottage in the early 1930s. The inference may be drawn that they had been cast up from largely undisturbed ground locations. Sludden (2004, 17) notes that the Muirfield collection comes from a number of locations in and around Ballantrae (Figure 5.3). The condition of the assemblage suggests that the majority of the artefacts come from Greddans Cottage.

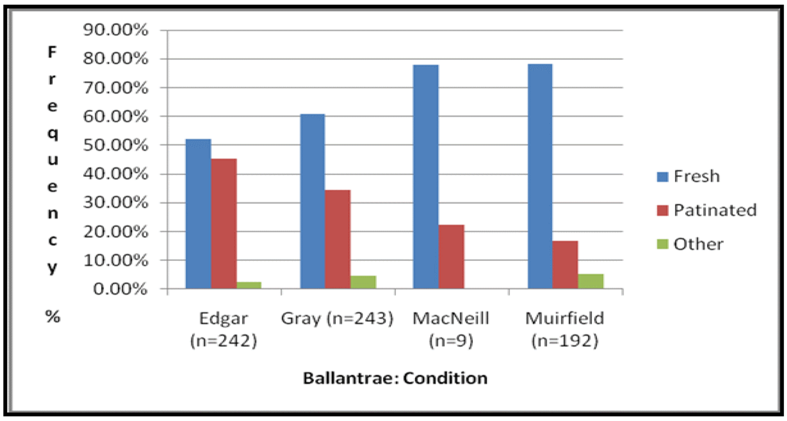

Figure 5.3: Condition of the collections from Ballantrae by provenance.

The only artefacts with wind gloss abrasion are from the Muirfield collections, which comprise of eight modified pieces, five blades, four flakes and a chunk. It is possible that these artefacts were collected from somewhere other than Greddans Cottage.

5.2.3.2 Girvan

The percentage frequencies of patination of the artefacts from Enoch Farm, Gallow Hill and Girvan Mains Farm are broadly coeval (Figure 5.4), although considerably higher than noted at Ballantrae. This may suggest that alluvial and colluvial surfaces are within the plough zone as noted during the excavations at Gallow Hill (Donnelly and MacGregor 2005, 34-35).

The assemblage from Girvan Golf Course can be distinguished from the other Girvan surface collections. The percentage incidence of patination statistically equates to the corresponding data for the Edgar collection from Ballantrae, which may indicate either less intensive ploughing disturbance, or recovery from potentially similar soil matrices.

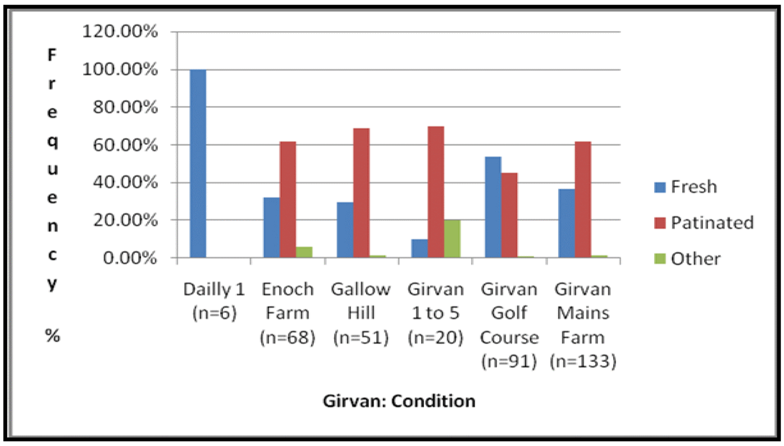

Figure 5.4: Condition of the collections from Girvan by provenance.

5.2.4 Cores

96.32% of the cores analysed from Ballantrae are flint; Girvan 98.98% (Table 5-6). The numerical occurrence and percentage frequency of core types are shown at Table 5-6 and Figure 5.5.

A higher incidence of bipolar cores is recorded at Ballantrae 20.59%; Girvan 10.20%. The metric data analysis of the platform cores based on the predominant removals visible shows profound common differences. The slightly lower occurrence of flake platform cores at Girvan is marked by a corresponding increase in blade platform cores (Table 5-6; Figure 5.5), always mindful that the classification of cores is based on the evidence of the last removals struck.

Four blade platform cores from Girvan and two from Ballantrae display evidence for anvil support. Three of the four cores from Girvan are in the assemblage from Enoch Farm. The use of the anvil for support in blade production may suggest that platform and bipolar reduction strategies were coeval at Ballantrae and Girvan. The evidence from primary flakes shows that small pebbles were opened using a bipolar technique, often with a hard hammer, indicating elements of an adaptive practice within a platform reduction strategy. However, bipolar reduction may represent either different routines, or activities relating to later periods of prehistory. The evidence of anvil support from blanks is slight with 2.82% and 5.03% of platform flakes and platform blades, respectively from Ballantrae, and 2.54% of platform blades from Girvan.

Blade and flake platforms cores are present in the excavated assemblages from Gallow Hill (Donnelly and MacGregor 2005, 56-57) and Littlehill Bridge (MacGregor and Donnelly 2001, 7). Bipolar cores were also recovered from Gallow Hill. Disc cores and bipolar cores were recovered from Area 1, which is equivalent to MacNeill's Girvan 2, 7 and 8 (cf. Section 4.5.2). It was because of this probable post-Mesolithic activity that the only four artefacts were sampled from Girvan 2, comprising of three platform cores and an oblique truncation (Appendix IV). The profile of the cores, including the bipolar cores from Area 4, has been interpreted as Late Mesolithic (Donnelly and MacGregor 2005, 56-57).

	Ballantrae: Total	%	Ballantrae: Bipolar	%	Ballantrae: Platform	%	Girvan: Total	%	Girvan: Bipolar	%	Girvan: Platform	%
Raw Material												
Flint	131	96.32%	26	92.86%	105	97.22%	97	98.98%	10	100%	87	98.86%
Chert	4	2.94%	2	7.14%	2	1.85%						
Chalcedony	1	0.74%			1	0.93%						
Agate							1	1.02%			1	1.14%
	136		28		108		98		10		88	
Core Type												
Bipolar	28	20.59%					10	10.20%				
Blade platform	46	33.82%			46	42.59%	43	43.88%			43	48.86%
Flake platform	22	16.18%			22	20.37%	13	13.27%			13	14.77%
Non-specific platform	40	29.41%			40	37.04%	31	31.63%			31	35.23%
Amorphous							1	1.02%			1	1.14%
	136				108		98				88	

Table 5-6: Numerical and percentage frequency of sampled cores from Ballantrae and Girvan by raw material and type.

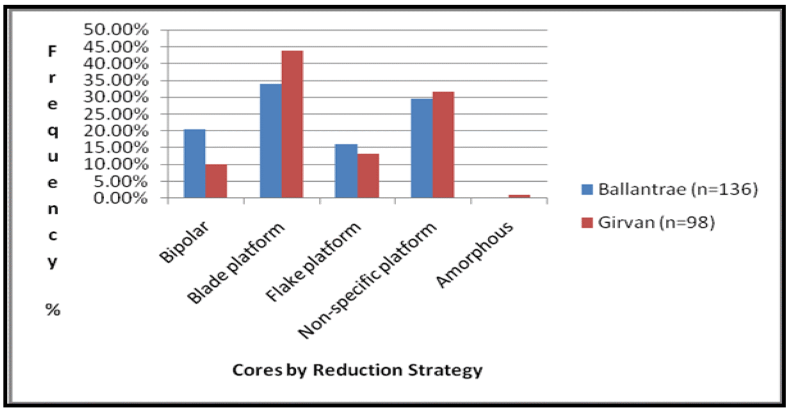

Figure 5.5: Percentage frequency of sampled cores from Ballantrae and Girvan by reduction strategy.

5.2.4.1 Core attributes: bipolar

The bipolar core attribute analysis can be found at Table 5-7. Metric data is shown in Table 5-8 and Figure 5.6.

Where it has been possible to determine the original size of the pebble flint used for cores, it may be seen that small pebbles are most commonly utilised followed by medium sized pebbles. Sub-rounded and rounded variants of sphericity dominate. The chert cores from Ballantrae derive from one medium sub-angular and one sub-rounded large pebbles.

62.50% of the flint cores from Ballantrae, where an original cortical surface is present, has a pitted/battered appearance indicating the use of beach pebble resources; Girvan 57.14%. A smooth/chalky cortex is recorded on 25.00% of cores from Ballantrae. 42.86% of the Girvan flint cores have a smooth/hard original surface; Ballantrae 12.50%. The sub-angular chert core has a pitted/battered cortex with sub-rounded example exhibiting a smooth/chalky cortical surface, which implies differential secondary sources of raw material.

Diffuse negative bulb scars suggest that a softer hammerstone was preferred as a percussor (Ballantrae 60.71%; Girvan 60.00%). The common differences in the choices made of percussor may offer further evidence for the use of complementary reduction strategies.

Many of the cores have been worked extensively, 82.14% of the Ballantrae cores have platform utilisation of more than 75.00%; Girvan 70.00%, which the metric data for the number of platforms, platform stage analysis and the average number of scars confirm.

There are common differences in the mean size dimensions of discarded bipolar cores from Ballantrae and Girvan (Table 5-8). The examples from Ballantrae are marginally larger across the three metric variants. This may equate to the number of platforms utilised. 70.00% of the cores from Girvan have three or more platforms; Ballantrae 57.14%. There are marked variations between Ballantrae and Girvan in the width of the negative scars (Table 5-8). The sample size is too small to read any significance into the analysis. All of the bipolar cores have flakes as the predominant removal except for one core from Ballantrae where there is a mix of flakes and 'blade like' flakes. A chert core with opposed cortical platforms was probably abandoned because of inclusions creating fracture planes.

The comparanda of the size dimensions of bipolar cores (Table 5-8) and platform cores (Table 5-10) suggests the improbability of using bipolar strategies to extend the working life of platform cores. This implies separate activities and possible different temporal events.

	Ballantrae	%	Girvan	%		Ballantrae	%	Girvan	%
Raw Material					**Predominant Removal**				
Chert	2	7.14%			Flake	27	96.43%	10	100%
Flint	26	92.86%	10	100%	Mixed	1	3.57%		
Total:	28	100%	10	100%					
					Number of Scars				
Bulb					Average	12.1		12.3	
Pronounced	11	39.29%	4	40.00%	4-6	2	7.14%	0	
Diffuse	17	60.71%	6	60.00%	7-9	3	10.71%	3	30.00%
					10-12	10	35.72%	4	40.00%
Percentage of Platform Area					13-15	7	25.00%	1	10.00%
< or 25%	1	3.57%			16-18	5	17.86%	1	10.00%
c.50%	4	14.29%	3	30.00%	19-21	1	3.57%	0	
c.75%	20	71.43%	1	10.00%	25-27	0		1	10.00%
100%	3	10.71%	6	60.00%					
					Original Pebble Size				
Reasons for Abandonment					Indeterminate	7	25.00%	5	50.00%
Indeterminate	1	3.57%			Small	11	39.29%	3	30.00%
Size	1	3.57%	2	20.00%	Medium	9	32.14%	2	20.00%
Flaws	1	3.57%			Large	1	3.57%	0	
Stepping & hinging	12	42.86%	4	40.00%					
Angle	2	7.14%			**Angularity/Sphericity**				
Angle & stepping & hinging	11	39.29%	4	40.00%	Indeterminate	7	25.00%	5	50.00%
					Sub-angular	3	10.71%		
Number of Visible Platforms					Sub-rounded	12	42.86%	4	40.00%
Indeterminate					Rounded	6	21.43%	1	10.00%
1	3	10.71%	1	10.00%					
2	10	35.71%	2	20.00%	**Cortex Type**				
3	10	35.72%	5	50.00%	Absent	2	7.14%	3	30.00%
4	5	17.86%	2	20.00%	Smooth/chalky	7	25.00%	0	
					Smooth/hard	3	10.71%	3	30.00%
Platform Stage Analysis					Pitted/heavily pitted	5	17.86%	0	
1	3	10.71%	1	10.00%	Battered	11	39.29%	4	40.00%
2	9	32.14%	2	20.00%					
3	11	39.29%	5	50.00%					
4	5	17.86%	2	20.00%					

Table 5-7: Attribute analysis of bipolar cores.

Core Dimensions				**Negative scars**		
Ballantrae				**Ballantrae**		
(n=28)	**L mm**	**W mm**	**Th mm**	(n=12)	**L mm**	**W mm**
Maximum	36	34	28	Maximum	25	22
Minimum	19	17	5	Minimum	13	8
Average	28.29	24.82	16.21	Average	19.42	13.75
STDEV	4.81	5.03	4.71	STDEV	3.55	4.03
Mode	27	25	17	Mode	20	12
Girvan				**Girvan**		
(n=10)	**L mm**	**W mm**	**Th mm**	(n=3)	**L mm**	**W mm**
Maximum	35	33	23	Maximum	24	14
Minimum	22	15	10	Minimum	15	6
Average	27	22	15.4	Average	18.67	9.67
STDEV	4.92	6.13	4.72	STDEV	4.73	4.04
Mode	22	17	16	Mode	N/A	N/A

Table 5-8: Bipolar core dimensions and metric data from negative scars.

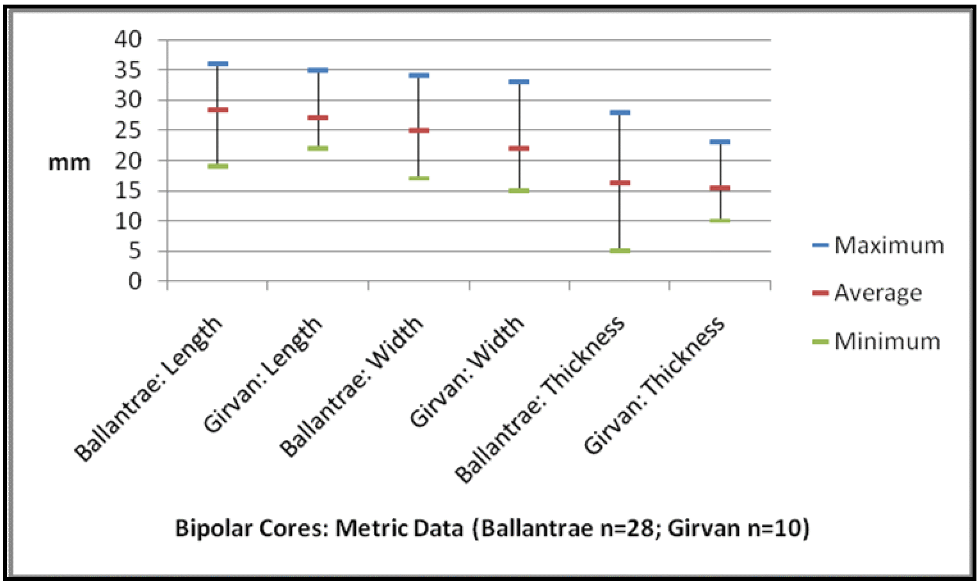

Figure 5.6: Metric data from the analysis of bipolar cores.

5.2.4.2 Core attributes: platform

Cores attributes from the typological and technological analysis are shown at Table 5-9.

69.44% of the flint cores from Ballantrae have to some degree an original cortical surface; Girvan 81.61%. Beach pebble flint is most common presenting with a pitted/battered surface; Ballantrae 49.33% and Girvan 53.52%, followed by cores with a smooth/hard cortex (Ballantrae 30.67%; Girvan 33.80%). An original smooth/chalky surface is recorded on 20.00% of the Ballantrae cores; Girvan 12.68%.

It has been possible to estimate the original size of the flint pebble for 55.24% of the flint cores from Ballantrae; Girvan 58.62%. Small pebbles appear to have preferred; Ballantrae 58.62% and Girvan 84.31% (see also Donnelly and MacGregor 2005, 50). There is a marked increase in the utilisation and possible availability of medium sized pebbles at Ballantrae 39.66%; Girvan 15.69%. The sphericity of the flint pebbles was established for 52.33% of the cores from Ballantrae; Girvan 56.32%. Sub-rounded and rounded dominate at 87.27% for Ballantrae and 95.92% for Girvan. Sub-angular attributes, possibly ‘cobble like’ pebbles, are more common at Ballantrae 12.73%; Girvan 4.08%.

Blade cores have the highest percentage frequencies; Ballantrae 42.59% and Girvan 48.86%, followed by non-specific platform cores (Ballantrae 37.04%; Girvan 35.23%). The incidence of flake cores has a greater occurrence at Ballantrae 20.37%; Girvan 14.77%. Non-specific platform cores may indicate task differentiation and sharing with different people using the same core to produce flakes and blades, or distinct phases of activity. Simple platforms dominate the sampled collections (Ballantrae 99.07%; Girvan 95.45%). The low incidence of complex or facetted platforms is considered to be as a result of error and not conceptual. Facetted platforms were noted as being common from Gallow Hill Area 1 (Donnelly and MacGregor 2005, 56). This may be indicative of routine practice and could relate to post-Mesolithic activity (contra *ibid*, 56).

The common differences in the percentage frequencies of the number of visible platforms suggests the efficacy of the grab samples as a true representation of the platform cores within the surface collections from Ballantrae and Girvan (Figure 5.8). Those cores with three platforms represent cores with opposed platforms with an earlier transverse platform. It is possible that the cores may have been dual opposed platform cores with the attributes for the other platform having been lost during the reduction process. Dual opposed platforms are comparatively rare (Ballantrae 1.85%; Girvan 2.28%). There are marked differences between Ballantrae and Girvan in the profiles of cores with two platforms (Figure 5.9). Opposed platforms are most common at Ballantrae with a percentage frequency of 55.17%, followed by cores with a dominant platform and an opposed sub-ordinate platform (41.38%) for the maintenance of a conical shape, which is usually representative of single platform cores. The reverse situation is recorded at Girvan where the dominant/sub-ordinate variant dominates at 66.67%; opposed 31.37%. These cores can be distinguished from true opposed cores where the sequence of removals would alternate between platforms (Figure 5.7).

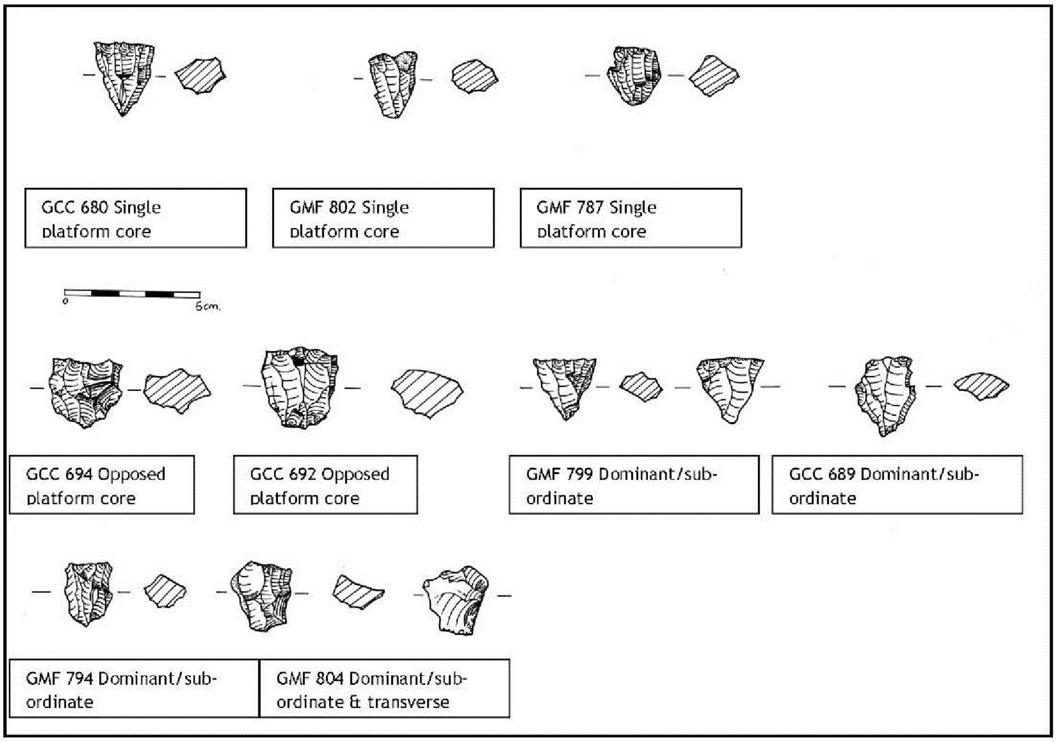

Figure 5.7: Illustration of a selection of platform cores from Girvan Golf Course and Girvan Mains Farm. © Alice Watterson used with permission.

There are two cores from Ballantrae (3.45%) and one from Girvan (1.96%) with a dominant platform and a transverse sub-ordinate platform. The platform stage analysis broadly equates to the occurrence of visible platforms.

The dominance of multi-directional and cores with two platforms were noted from Gallow Hill Area 2, where 56.80% have negative blade scars (Donnelly and MacGregor 2005, 56). Single platform cores were most common at Littlehill Bridge. Seven of the eleven (63.64%) have negative blade scars (MacGregor and Donnelly 2001, 7).

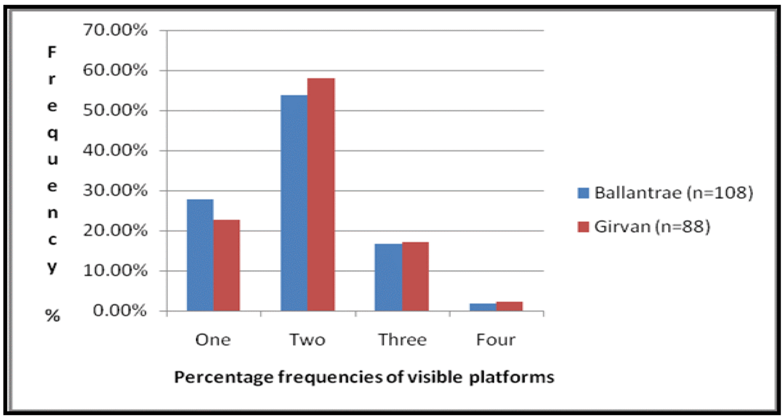

Figure 5.8: Percentage frequencies of the number of visible platforms of platform cores from Ballantrae and Girvan.

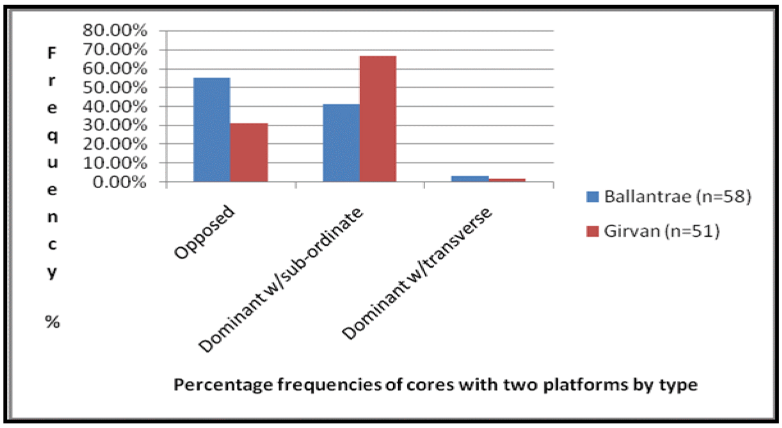

Figure 5.9: Percentage frequency of platform cores with two platforms from Ballantrae and Girvan by type.

Two of the cores from Girvan have a pronounced negative bulb of percussion. All of the other cores from Ballantrae and Girvan present with attributes for a diffuse bulb suggesting a statistically exclusive preference for a softer hammer.

The mean metric data for the core populations from Ballantrae and Girvan in respect of core size and the largest negative scars measured from the flaking surface cannot be distinguished. A similar pattern is seen in the average core dimensions when the analysis is broken down by core type (Table 5-10).

85.18% of the cores from Ballantrae have a worked percentage of platform area of 75.00% or more; Girvan 82.95%. The intensive working of the cores is further exemplified by the data of the number of scars recorded on each of the cores with averages of 13.6 for Ballantrae and 12.45 for Girvan.

The failure to be able to maintain a working angle to the core, and stepping and hinging to the flaking surface account for 88.88% of the probable reason for the abandonment of the cores at Ballantrae; Girvan 93.17%. Discard due to size is relatively low at 9.26% for Ballantrae and 4.55% at Girvan.

	Ballantrae	%	Girvan	%		Ballantrae	%	Girvan	%
Raw Material					**Predominant Removal**				
Chert	2	1.85%	0		Indeterminate	0		0	
Flint	105	97.22%	87	98.86%	Flake	22	20.37%	14	15.91%
Agate	0		1	1.14%	Blade	46	42.59%	43	48.86%
Chalcedony	1	0.93%	0		Mixed	40	37.04%	31	35.23%
Total:	108	100%	88	100%					
					Number of Scars				
Bulb					Average	14		12	
Absent	0		0		1-3	1	0.93%	1	1.14%
Pronounced	0		2	2.27%	4-6	5	4.63%	6	6.82%
Diffuse	108	100%	86	97.73%	7-9	13	12.04%	18	20.45%
					10-12	31	28.70%	23	26.14%
Percentage of Platform Area					13-15	21	19.44%	22	25.00%
< or 25%	1	0.93%	1	1.14%	16-18	22	20.37%	8	9.09%
c.50%	15	13.89%	14	15.91%	19-21	8	7.41%	6	6.81%
c.75%	51	47.22%	45	51.14%	22-24	7	6.48%	3	3.41%
100%	41	37.96%	28	31.81%	25-27	0		1	1.14%
Reasons for Abandonment					**Original Pebble Size**				
Indeterminate	1	0.93%	1	1.14%	Indeterminate	49	45.37%	36	40.91%
Size	10	9.26%	4	4.55%	Small	35	32.41%	44	50.00%
Flaws	1	0.93%	1	1.14%	Medium	23	21.29%	8	9.09%
Stepping & hinging	66	61.11%	58	65.90%	Large	1	0.93%	0	
Angle	4	3.70%	3	3.41%					
Angle & stepping & hinging	26	24.07%	21	23.86%	**Angularity/Sphericity**				
					Indeterminate	52	48.15%	38	43.18%
Number of Visible Platforms					Angular	0		0	
1	30	27.78%	20	22.73%	Sub-angular	7	6.48%	2	2.28%
2	58	53.70%	51	57.95%	Sub-rounded	42	38.89%	43	48.86%
3	18	16.67%	15	17.04%	Rounded	7	6.48%	5	5.68%
4	2	1.85%	2	2.28%					
					Cortex Type				
Platform Stage Analysis					Absent	32	29.63%	16	18.18%
1	30	27.78%	20	22.73%	Smooth/chalky	15	13.89%	9	10.23%
2	58	53.70%	50	56.82%	Smooth/hard	24	22.22%	25	28.41%
3	17	15.74%	14	15.91%	Pitted/heavily pitted	20	18.52%	9	10.23%
4	3	2.78%	3	3.41%	Battered	17	15.74%	29	32.95%
Core Platform Type					**Platform Type**				
Blade	46	42.59%	43	48.86%	Simple	107	99.07%	84	95.45%
Flake	22	20.37%	13	14.77%	Complex	1	0.93%	4	4.55%
Non-specific	40	37.04%	31	35.23%					
Amorphous	0		1	1.14%					

Table 5-9: Attribute analysis of platform cores.

Core Dimensions

Ballantrae				**Girvan**			
(n=108)	**L mm**	**W mm**	**Th mm**	(n=88)	**L mm**	**W mm**	**Th mm**
Maximum	42	55	25	Maximum	42	36	27
Minimum	14	12	6	Minimum	17	10	7
Average	25.26	22.52	16.91	Average	25.52	21.51	16.45
STDEV	5.66	5.62	4.04	STDEV	5.14	4.92	4.16
Mode	25	20	14	Mode	25	20	17

Negative Scars

Ballantrae			**Girvan**		
(n=97)	**L mm**	**W mm**	(n=74)	**L mm**	**W mm**
Maximum	32	23	Maximum	28	16
Minimum	11	3	Minimum	10	4
Average	18.82	8.84	Average	18.57	8.14
STDEV	4.22	2.87	STDEV	4.15	2.4
Mode	18	7	Mode	22	7

Ballantrae **Blade cores**				**Girvan** **Blade cores**			
(n=46)	**L mm**	**W mm**	**Th mm**	(n=43)	**L mm**	**W mm**	**Th mm**
Maximum	33	31	25	Maximum	35	27	24
Minimum	14	12	9	Minimum	17	10	7
Average	24.33	20.3	15.7	Average	23.93	19.6	15.44
STDEV	4.72	4.25	3.66	STDEV	4.14	4.5	4.17
Mode	29	19	14	Mode	23	20	15

Flake cores				**Flake cores**			
(n=22)	**L mm**	**W mm**	**Th mm**	(n=13)	**L mm**	**W mm**	**Th mm**
Maximum	40	55	25	Maximum	42	30	27
Minimum	17	16	12	Minimum	20	19	16
Average	27.73	27.09	19.45	Average	28.31	24.08	19.77
STDEV	6.24	7.4	3.97	STDEV	5.86	3.64	3.22
Mode	25	24	24	Mode	25	20	17

NSP cores				**NSP cores**			
(n=40)	**L mm**	**W mm**	**Th mm**	(n=31)	**L mm**	**W mm**	**Th mm**
Maximum	42	33	24	Maximum	41	36	27
Minimum	15	15	6	Minimum	17	15	10
Average	24.98	22.55	16.9	Average	26.81	22.87	16.52
STDEV	6.04	4.34	3.95	STDEV	5.32	5.02	3.94
Mode	23	20	15	Mode	30	20	17

Table 5-10: Metric data from the analysis of platform cores and by core type, including data of negative scars from platform cores.

Two flint platform cores, one each from Ballantrae and Girvan Mains Farm, were abandoned because of central lugs visible in the surface of simple platforms. It is possible that these flaws only became an issue when the percentage area of the flaws became too great in relation to the remaining working platform area.

5.2.5 Core rejuvenation and core maintenance

From the data noted in Section 1.2.4.2, the principal core maintenance strategy was the use of a sub-ordinate opposed platform from which to detach blanks to maintain the conical shape of the core.

From a scoping appraisal, which involved scrutinising the majority of flakes and 'blade like' flakes in the collections from Ballantrae and Girvan there are no core rejuvenation flakes utilising a transverse side blow. Core rejuvenation blanks are struck at right angles to the platform to remove errors culminating with stepping and hinging to the flaking surface of the cores. Generally, plunging terminations are considered to be knapping error, however, an overshot removal to the distal end of a core from Girvan provided the basis for a sub-ordinate opposed platform.

5.2.6 Technological analysis of the debitage

Due to the nature of the palimpsest assemblages incorporating artefacts from other later epochs in prehistory, although potentially low in the overall populations, small grab samples of platform flakes were chosen for technological analysis from Ballantrae and Girvan. The samples focus on secondary and tertiary artefacts, many with edge damage. Blades form the principal emphasis for analysis of the debitage from Ballantrae and Girvan.

5.2.6.1 Platform flakes

The character of the flakes may be found at Table 5-11, and the attribute analysis at Table 5-12.

	Ballantrae	%	Girvan	%
Flint	67	94.37%	27	100.00%
Agate	2	2.82%		
Chalcedony	1	1.40%		
Chert	1	1.41%		
	71		27	
Primary	3	4.22%		
Secondary	27	38.03%	6	22.22%
Tertiary	41	57.75%	21	77.78%
Primary regular				
Primary irregular	3	100.00%		
Secondary regular	9	33.33%	3	50.00%
Secondary irregular	18	66.67%	3	50.00%
Tertiary regular	16	39.02%	12	57.14%
Tertiary irregular	25	60.98%	9	42.86%

Table 5-11: Character of platform flakes from Ballantrae and Girvan.

Simple platforms dominate where platforms are present; Ballantrae 96.61% and Girvan 95.23%. Platform preparation is relatively high at 44.06% for Ballantrae; Girvan 42.86%, which probably accounts for the prominent percentage occurrence of regular secondary and tertiary flakes. Cortical platforms are noted on two flakes from Ballantrae and one from Girvan.

A softer hammer was the preferred percussor with a diffuse bulb of percussion evident on 91.53% of the flakes from Ballantrae; Girvan 85.71%. Pronounced bulbs associated with a hard hammer have a percentage frequency of 8.47% at Ballantrae. The occurrence at Girvan is comparably high at 14.29%, which either may be as a result of sample bias, or may also be responsible for the wide variations in fragmentation patterns and distal termination attributes. Flat and pronounced bulbs of percussion have the highest percentage frequency from Gallow Hill Area 2, with pronounced and diffuse bulbs equating at Gallow Hill Area 4 (Donnelly and MacGregor 2005, 57). The flakes from Gallow Hill Areas 2 and 4 comprise of 535 artefacts and, therefore, must carry greater interpretive weight than the 27 flakes from Girvan which were analysed.

Cognisant of the possibility of sample bias, the dominant remaining platform size for flakes is point only/small narrow (Ballantrae 66.67%; Girvan 60.00%) suggesting implies a focus on the production of thinner flakes. For example, the mean metric data shows thickness at 5.39mm (standard deviation ‘STDEV’ ±2.34mm) for Ballantrae with a mode of 5mm. The corresponding data from

Girvan is 5.33mm (STDEV ±2.83mm) and mode of 3mm, which correlates to the secondary mode from Ballantrae. The average metric data for flakes across the three measured variants are statistically indistinguishable (Table 5-13).

The dorsal scarring patterns broadly equate to dominance of single and opposed platform cores (Table 5-12).

	Ballantrae	%	Girvan	%		Ballantrae	%	Girvan	%
Fragmentation Patterns					**Dorsal Scarring Pattern**				
Complete	35	49.30%	7	25.93%	Absent	3	4.23%		
Proximal missing	7	9.86%	2	7.41%	Longitudinal	39	54.93%	21	77.78%
Distal missing	15	21.13%	12	44.44%	Opposed	23	32.39%	6	22.22%
Medial fragment	5	7.04%	4	14.81%	Crossed	3	4.23%		
Split/truncated width	1	1.41%			Multi-directional	3	4.22%		
Proximal spalling	7	9.85%	2	7.41%					
Distal spalling	1	1.41%			**Dorsal Surface**				
	71		27		Absent	51	71.83%	24	88.89%
Distal Termination					Step	18	25.35%	3	11.11%
Abrupt	28	39.44%	21	77.78%	Hinge	2	2.82%		
Hinge	4	5.63%	1	3.70%					
Plunging	5	7.04%			**Platform Preparation**				
Feathered	16	22.54%	1	3.71%	Indeterminate	12	16.90%	6	22.22%
Jagged/irregular	17	23.94%	4	14.81%	Cortical	2	2.82%	1	3.70%
Distal spalling	1	1.41%			Plain/simple	31	43.66%	11	40.74%
					Plain w/scrub preparation	16	22.54%	5	18.52%
Bulb Types					Plain with isolated scrub	10	14.08%	4	14.82%
Absent	12	16.90%	6	22.22%					
Pronounced	5	7.04%	3	11.11%	**Remaining Platform Size**				
Diffuse	53	74.65%	18	66.67%	Indeterminate	14	19.72%	7	25.93%
Bulb with lip	1	1.41%			Point only	14	19.73%	5	18.52%
					Small/narrow	24	33.80%	7	25.93%
Location of Cortex					Small/wide	4	5.63%	5	18.51%
Absent	41	57.75%	21	77.78%	Broad/narrow	11	15.49%		
Proximal	2	2.81%	1	3.70%	Large	4	5.63%	3	11.11%
Distal	5	7.04%	1	3.70%					
Lateral left	9	12.67%	1	3.71%	**Anvil Supported**	2	2.82%	0	
Lateral right	2	2.82%							
Combination	9	12.68%	3	11.11%	**Colour**				
Total	3	4.23%			Greys	29	74.36%	5	100%
					Browns	9	23.08%		
Cortex Type					Greenish greys	1	2.56%		
Absent	41	57.75%	21	77.78%					
Smooth/chalky	14	19.72%	1	3.71%					
Smooth/hard	4	5.63%							
Pitted	9	12.67%	1	3.70%					
Battered	3	4.23%	4	14.81%					

Table 5-12: Attribute analysis of platform flakes from Ballantrae and Girvan.

Ballantrae			
(n=44)	L mm	W mm	Th mm
Maximum	42	24	12
Minimum	8	6	1
Average	23.7	15.59	5.39
STDEV	6.74	4.33	2.34
Mode	18	17	5
Girvan			
(n=9)	L mm	W mm	Th mm
Maximum	39	34	11
Minimum	17	9	3
Average	24.78	16.67	5.33
STDEV	8.27	7.71	2.83
Mode	17	9	3

Table 5-13: Metric data from the analysis of platform flakes deemed complete for measurement.

5.2.6.2 Platform blades

The typological and technological analysis of the platform cores provides unequivocal proxy evidence for the presence of blade industries at Ballantrae and Girvan (see also Donnelly and MacGregor 2005, 56; MacGregor and Donnelly 2001, 7). The character analysis of platform blades is set out at Table 5-14 and the attributes at Table 5-17.

	Ballantrae	%	Girvan	%
Flint	199	100.00%	118	100.00%
Primary	1	0.50%	2	1.70%
Secondary	33	16.58%	26	22.03%
Tertiary	165	82.92%	90	76.27%
Primary regular			1	50.00%
Primary irregular	1	100.00%	1	50.00%
Secondary regular	23	69.97%	23	88.46%
Secondary irregular	10	30.03%	3	11.54%
Tertiary regular	137	83.03%	69	76.67%
Tertiary irregular	28	16.97%	21	23.33%

Table 5-14: Character of platform blades from Ballantrae and Girvan.

The analysis of flint blades by cortex, albeit from a limited dataset, shows common differences in the utilisation of beach pebble resources. Smooth/chalky cortical flint has a higher occurrence at Ballantrae compared to the smooth/hard variant with the reverse situation noted at Girvan. A breakdown of blade cores from Girvan determines that the frequency of pitted/battered cortex is statistically indistinguishable from the blades. Greater variances are documented at Ballantrae, although the data does suggest some correlation, which is not evident in the comparison of the two other cortical variants (Figure 5.10). This is not considered to be as a result of a sample bias because of the numerical quantities of cores and blades chosen for analysis, although recovery bias may be factor. It may be suggested that the preponderance of tertiary pieces is masking the common differences between blades and cores. It may also be argued that the absence of correlation implies that blade cores with smooth/chalky and smooth/hard variants generally required the extensive removal of the cortical surface to control production of blade blanks. This does imply that blade cores were more extensively worked than other platform cores (Tables 5-9 and 5-10), where mean size and the average number of scars on cores supports this interpretation. The inclusion of non-specific platform cores does not offer a solution to the apparent anomaly. The data from Ballantrae broadly equates, although for Girvan the occurrence for smooth/chalky and smooth/hard variants are reversed because of the preference of the latter for non-specific platform cores (Table 5-15).

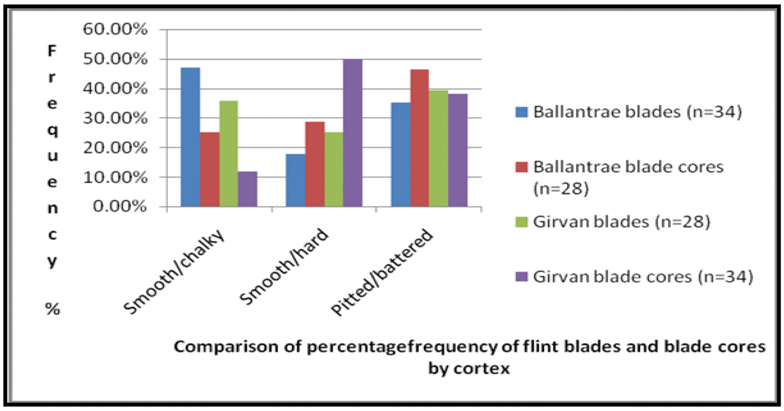

Figure 5.10: Comparison of the percentage frequency of blades and blade cores by cortex type.

	Smooth/chalky	Smooth/hard	Pitted/battered
Ballantrae blades (n=34)	47.06%	17.65%	35.29%
Ballantrae blade cores (n=28)	25.00%	28.57%	46.43%
Ballantrae blade & nsp cores (n=59)	22.03%	32.20%	45.76%
Girvan blades (n=28)	35.71%	25.00%	39.29%
Girvan blade cores (n=34)	11.76%	50.00%	38.24%
Girvan blade & nsp cores (n=60)	13.33%	35.00%	51.67%

Table 5-15: Percentage frequency of flint blades, blade platform cores and non-specific platform cores.

Simple platforms are statistically exclusive; Ballantrae 98.71% and Girvan 95.74%. The use of a softer hammerstone dominates with all of the blades from Girvan presenting with a diffuse bulb of percussion; Ballantrae 98.08%. Two blades from Girvan have bulb and lip attributes. Evidence for platform preparation is high at Ballantrae with the scrubbing of the core face recorded on 43.87% of blades; although marginally lower at Girvan 31.91% (see also Donnelly and MacGregor 2005, 56). It is considered that the close attention paid to platform preparation is a major factor in the high values of regularity for secondary and tertiary blades; Ballantrae 80.81% and Girvan 79.31%. Point only/small narrow attributes of remaining platform size are most common; Ballantrae 80.93% and Girvan 88.89%. This may infer a skilled and efficient use of cores in the production of thin blades to a conceptual schema.

5.03% of blades from Ballantrae have attributes associated with anvil support; Girvan 2.54%. An inference can be drawn that platform and bipolar reduction strategies were coeval; however, the percentage frequencies do not warrant a conclusion that some bipolar working may refer to a different period of activity (cf. Section 5.2.4.1).

There are common differences in the variant proximal profiles of platform blades from Ballantrae and Girvan (Figure 5-11; Table 5-17). The relatively high incidence of blades where the proximal end is missing may either represent an intentional strategy to either accommodate hafting or breakage during reduction. The greater occurrence of complete blades from Ballantrae may be associated with the higher degree of platform preparation. The variation statistically compares to the enhanced frequency of blades from Girvan where the distal end is missing. The differences are not so marked to imply a reduced skill level, although task differentiation may be a factor.

The scarring patterns for blades from Ballantrae and Girvan are analogous and correspond to the dominance of single and opposed cores (Figure 5.12). A similar interpretation can be proffered from the analysis of the dorsal surface attributes (Figure 5.13), where the majority of blades represent the proficient production of blades with a clean ventral surface.

The mean metric data for blades from Ballantrae and Girvan largely fall with consistent parameters apart from the distortion caused by presence of a few very long blades at Ballantrae (Table 5-16; Figure 5.14). The difference in the modes across the three metric variants is never more than 1mm. Based on the maximum and minimum parameters for the width and thickness of microliths, 29.77% of blades from Ballantrae fit within those constraints; Girvan 63.78%. The maximum width and thickness for Girvan microliths is 2mm more than the corresponding measurements for Ballantrae. If the larger pieces from Girvan are regarded as anomalous and the same metric criteria is used the percentage of blades that are commensurate with metric parameters falls to 21.74%.

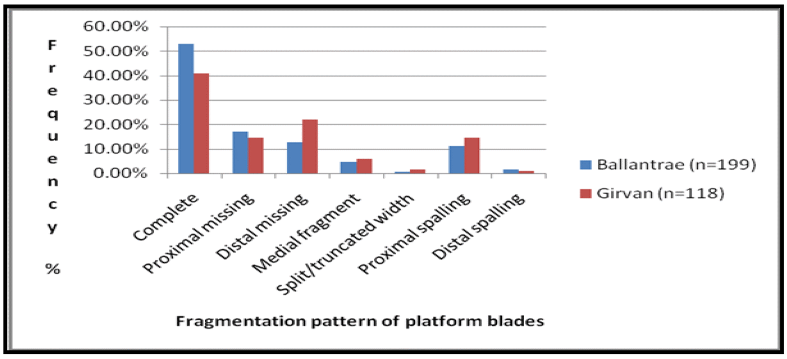

Figure 5.11: Percentage frequencies of fragmentation patterns for platform blades.

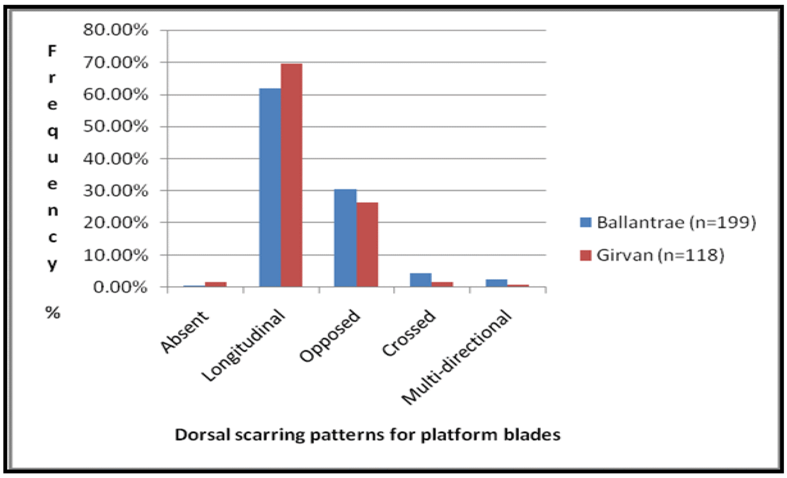

Figure 5.12: Percentage frequencies of dorsal scarring patterns for platform blades.

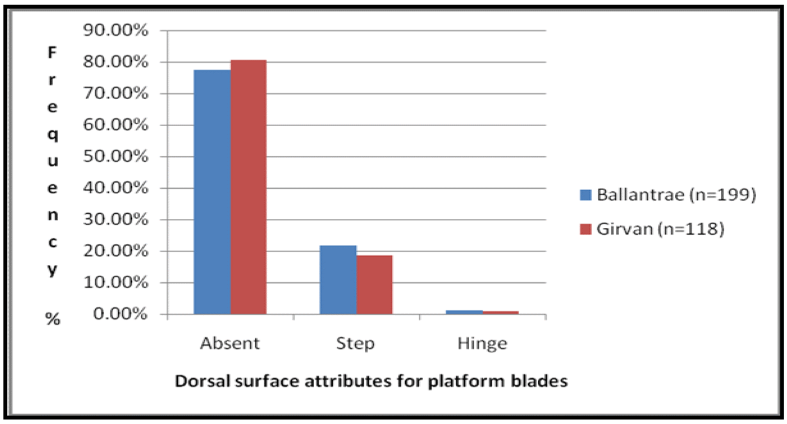

Figure 5.13: Percentage frequencies of dorsal surface attributes for platform blades.

Ballantrae			
(n=131)	**L mm**	**W mm**	**Th mm**
Maximum	50	19	9
Minimum	11	3	1
Average	24.95	9.38	3.63
STDEV	7.33	3.05	1.72
Mode	24	10	3
Girvan			
(n=69)	**L mm**	**W mm**	**Th mm**
Maximum	36	14	7
Minimum	13	2	2
Average	23.51	8.84	3.16
STDEV	4.94	2.1	1.27
Mode	25	9	2

Table 5-16: Size dimensions of platform blades deemed complete for measurement.

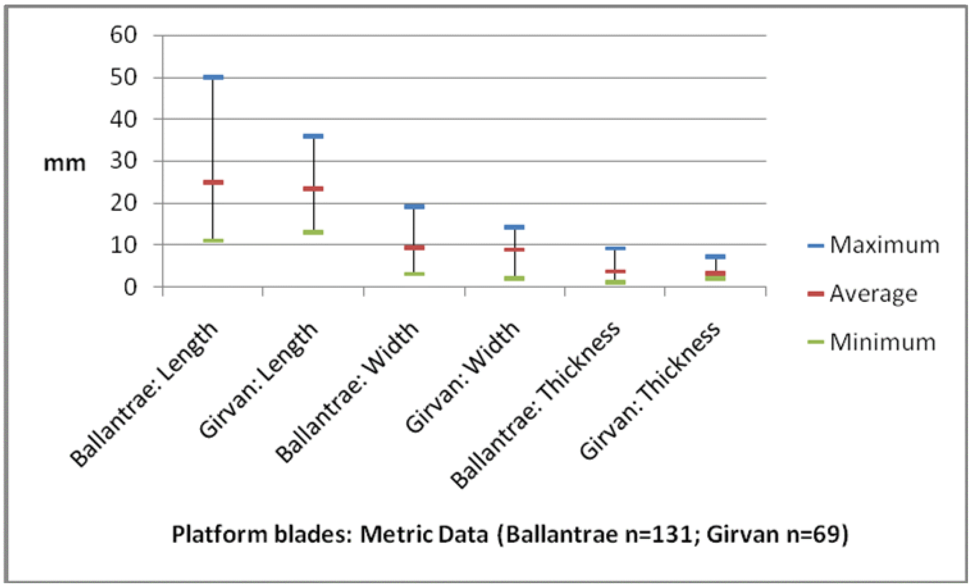

Figure 5.14: Metric data of platform blades deemed complete for measurement.

	Ballantrae	%	Girvan	%		Ballantrae	%	Girvan	%
Fragmentation Patterns					**Dorsal Scarring Pattern**				
Complete	105	52.76%	48	40.68%	Absent	1	0.50%	2	1.69%
Proximal missing	34	17.09%	17	14.41%	Longitudinal	123	61.82%	82	69.49%
Distal missing	25	12.56%	26	22.03%	Opposed	61	30.65%	31	26.27%
Medial fragment	9	4.52%	7	5.93%	Crossed	9	4.52%	2	1.70%
Split/truncated width	1	0.50%	2	1.69%	Multi-directional	5	2.51%	1	0.85%
Proximal spalling	22	11.06%	17	14.41%					
Distal spalling	3	1.51%	1	0.85%	**Dorsal Surface**				
	199		118		Absent	154	77.38%	95	80.51%
Distal Termination					Step	43	21.61%	22	18.64%
Abrupt	59	29.65%	58	49.15%	Hinge	2	1.01%	1	0.85%
Hinge	15	7.54%	7	5.93%					
Plunging	20	10.05%	7	5.93%	**Platform Preparation**				
Feathered	80	40.20%	32	27.12%	Indeterminate	44	22.11%	24	20.34%
Jagged/irregular	20	10.05%	13	11.02%	Cortical	2	1.01%	4	3.39%
Distal spalling	5	2.51%	1	0.85%	Plain/simple	85	42.71%	60	50.85%
					Plain w/scrub preparation	34	17.09%	10	8.47%
Bulb Types					Plain with isolated scrub	34	17.08%	20	16.95%
Absent	43	21.61%	24	20.34%					
Pronounced	3	1.51%			**Remaining Platform Size**				
Diffuse	153	76.88%	92	77.97%	Indeterminate	46	23.12%	28	23.73%
Bulb with lip			2	1.69%	Point only	57	28.64%	41	34.74%
					Small/narrow	66	33.17%	39	33.05%
Location of Cortex					Small/wide	8	4.02%	1	0.85%
Absent	165	82.91%	90	76.27%	Broad/narrow	14	7.03%	8	6.78%
Proximal	2	1.01%	2	1.69%	Large	8	4.02%	1	0.85%
Distal	17	8.54%	12	10.17%					
Lateral left	4	2.01%	6	5.09%	**Anvil Supported**	10	5.03%	3	2.54%
Lateral right	4	2.01%	5	4.24%					
Combination	6	3.02%	3	2.54%	**Colour**				
Total	1	0.50%			Greys	100	76.92%	42	89.36%
					Browns	28	21.54%	4	8.51%
Cortex Type					Reds	2	1.54%	1	2.13%
Absent	165	82.91%	90	76.27%		130		47	
Smooth/chalky	16	8.04%	10	8.47%					
Smooth/hard	6	3.02%	7	5.93%					
Pitted	9	4.52%	7	5.94%					
Battered	3	1.51%	4	3.39%					

Table 5-17: Attribute analysis of platform blades.

5.2.7 Discussion

The analysis of the sampled assemblages from Ballantrae and Girvan shows the continuity of technological practice of the coastal occupations of South Ayrshire during the Mesolithic period. Statistically there is the exclusive exploitation of flint as a raw material, and the dominance of simple platforms and the use of a soft hammer as the preferred percussor. There is a mix of bipolar and platform reduction strategies. The anvil support for blade platform artefacts is noted on both cores and debitage products. The evidence is limited, but it is clear that both reduction strategies were employed contemporaneously, and in pebble opening strategies the use of the bipolar technique represented adaptive practice within the platform reduction strategy, although it remains possible that some bipolar products may speak to different events and possibly later periods of occupation not necessarily outwith the Mesolithic. For platform reduction there is the utilisation of blade, non-specific and flake platforms, with broad common differences in the percentage frequencies of these variants, which extends to the mean dimensions of discarded cores (Figure 5.15), the orientation of cores based on the number of visible platforms, the intensive working of cores, rejuvenation and maintenance strategies and the reasons for probable abandonment.

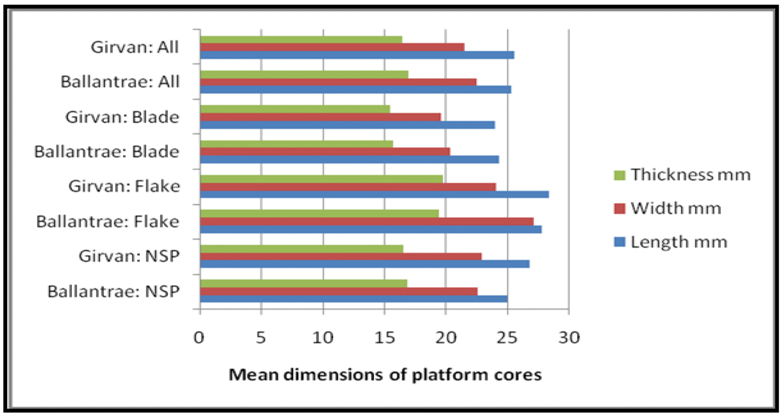

Figure 5.15: Comparison of mean dimensions of platform cores from Ballantrae and Girvan.

Small flint pebbles are the most common raw material utilised for platform cores, although there is a higher incidence of medium sized pebbles at Ballantrae (Figure 5.16). This is not thought to be as a result of availability because the use of medium pebbles equate for bipolar cores at Ballantrae and Girvan. These disparities in choice may indicate different groups of hunter gatherers and/or different temporal events.

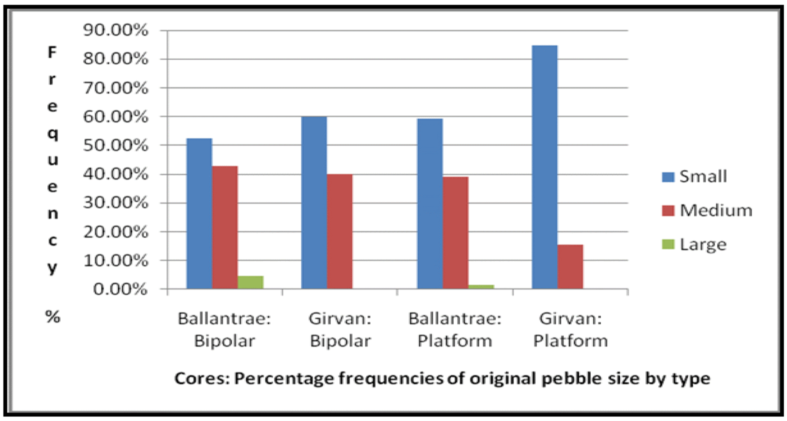

Figure 5.16: Percentage frequencies of original pebble size of cores by type and reduction strategy (Ballantrae n=80; Girvan n=57).

The utilisation of different flint resources broadly equate for platform reduction at Ballantrae and Girvan, although there is an increase in the use of alluvial/riverine flint pebbles with a rolled smooth/chalky cortex at Ballantrae (Figure 5.17). Beach pebbles are preferred for bipolar working. The dataset is small and it is, therefore, not possible to draw any firm conclusions with regard to choices made and different episodes of activity.

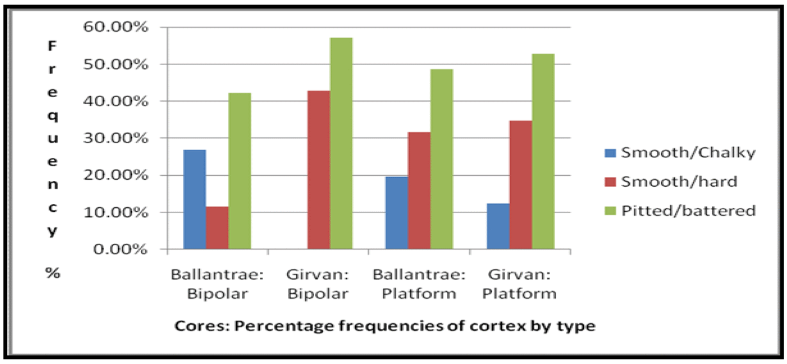

Figure 5.17: Percentage frequency of original cortical surface recorded on cores by type and reduction strategy (Ballantrae n=102; Girvan n=79).

The percentage frequencies of patinated artefacts suggests greater disturbance at Girvan, although the potential effects of the soil matrix from which they were recovered cannot be overlooked. The raw data is potentially skewed by the Muirfield collection, which was predominantly recovered from garden trenching at Greddans Cottage, Ballantrae. Analysis shows that disregarding Muirfield there remains a higher degree of patination at Girvan.

The evidence from blade and non-specific platform cores and blanks determines the presence of blade industries at Ballantrae and Girvan. The percentage occurrence of scrub preparation to the core face has resulted in remarkably high frequencies of regularity in the blade populations. The mean dimensions for blades from Ballantrae and Girvan are statistically indistinguishable. The dorsal scarring of blades matches the core orientation analysis.

5.3 Secondary technology

99.20% of artefacts with retouch from Ballantrae are flint; Girvan 99.19%, with two tool forms of agate from the former and one of quartz from the latter. The numerical and percentage frequency of artefacts with secondary modification is shown at Table 5-18.

	Ballantrae	%	Girvan	%
Microliths	23	9.24%	19	15.45%
Microlith fragments	10	4.02%	3	2.44%
Oblique truncations	27	10.85%	34	27.64%
Microburins	4	1.61%	6	4.88%
Notch & snap	30	12.05%	11	8.94%
Lamelle à cran	3	1.20%	3	2.44%
Scrapers	112	44.98%	42	34.14%
Abruptly backed	9	3.61%		
Thin-backed	7	2.81%		
Point	1	0.40%		
Denticulate	3	1.20%		
Notch	11	4.42%	1	0.82%
Awl	1	0.40%		
Miscellaneous retouch	8	3.21%	4	3.25%
	249	100.00%	123	100.00%

Table 5-18: Numerical and percentage frequency of artefacts with secondary modification.

The technological analysis of tool forms by category indicates marked variations between Ballantrae and Girvan (Figure 5.18). Scrapers are most common at Ballantrae (44.98%), followed by truncations (25.71%), other tool forms (16.05%) and microliths including fragments (13.26%). In contrast, at Girvan truncations have the greater occurrence at 43.90%; scrapers 34.14%, microliths 17.89% and other 4.07%. The other modified artefacts from Ballantrae represent a wide range of tool forms. The datasets may indicate a degree of task differentiation between Ballantrae and Girvan, which may also relate to different temporal episodes of activity. However, collection bias may be significant and it is, therefore, difficult to draw firm interpretations from the disparities in the composition of other tool forms.

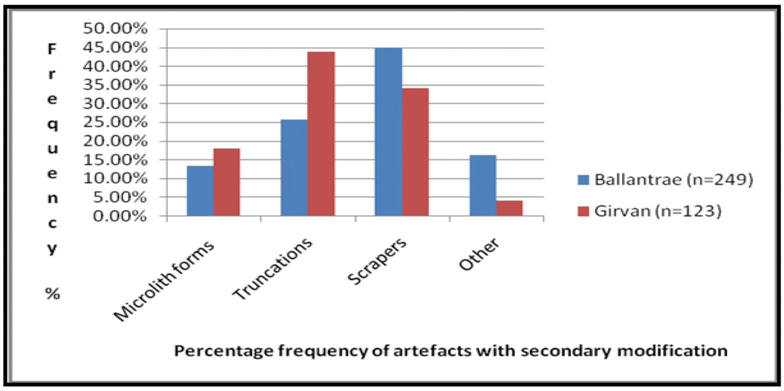

Figure 5.18: Percentage frequencies of artefacts with secondary modification by category.

The percentage frequency of different types of artefact with secondary modification does not give an indication of the range or diversity of tool forms which can be ascertained by using the Shannon-Weaver Diversity Index (Finlay *et al*. 2000a, 571-572). The mathematical formula for the Index may be expressed as [eH'= -Σ Pi ln (Pi)], where $e^{H'}$, which can also be expressed as *H'*, is the Shannon-Weaver Diversity Index and *Pi* is the relative number of each class or type (Pielou 1966; University of Hawaii nd.). Translated into archaeological parlance, the index is a function of the percentage of a population of more than one type, attribute or classification within a group of artefacts, which provides an approximation of the diversity of either an artefact within the given types, attributes or classifications of those groups. The retouched artefacts were organised into four groupings, namely microliths, scrapers, truncations and other pieces. The latter class included miscellaneous retouch but not artefacts which present with edge damage only. There is a greater diversity of tool forms at Ballantrae using the Shannon-Weaver Diversity Index (Pielou 1966) at 3.56; Girvan 3.21 (Figure 5.19).

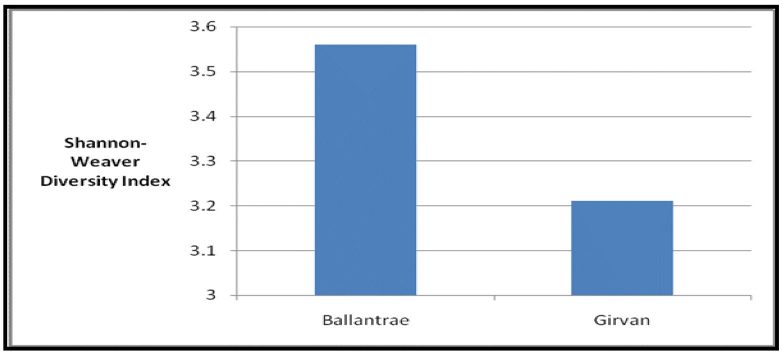

Figure 5.19: Diversity of artefacts with secondary modification using the Shannon-Weaver Diversity Index.

All of the microliths and microlith fragments in the surface collections from Ballantrae and Girvan have been analysed. It is possible that these forms are under-represented by surface collection bias, e.g. the ratio of microliths to other tool forms is 3:2 from Gallow Hill (Donnelly and MacGregor 2005, 48).

The presence of blade industries has been established and coupled with the recovery of microburins from different sites (Table 5-19) would imply that microliths were manufactured at both Ballantrae and Girvan.

	Microliths	Microburins
Ballantrae		
Edgar	19	1
Gray 5	10	2
Gray 5W	2	
Muirfield	2	1
	33	4
Girvan		
Golf Course	8	2
Girvan Mains Farm	8	3
Gallow Hill	4	
Girvan 1	1	
Enoch Farm	1	1
	22	6

Table 5-19: Distribution of microliths, including microlith fragments and microburins.

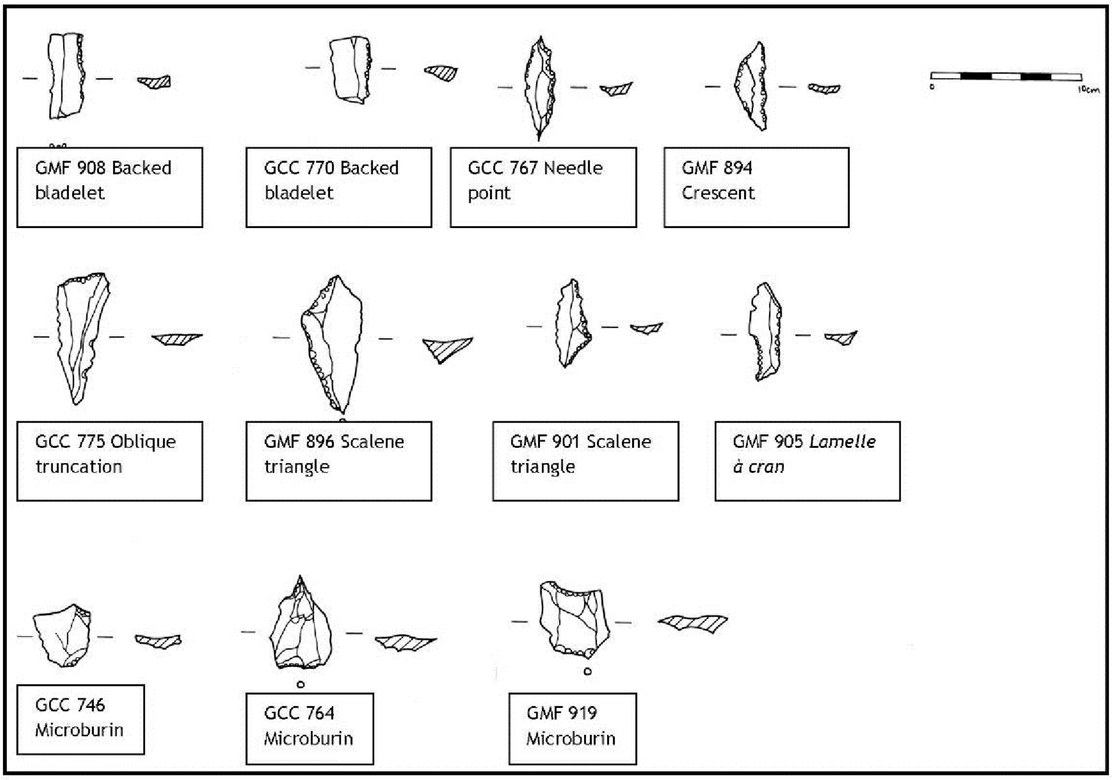

Figure 5.20: Illustration of selected modified artefacts from Girvan Golf Course and Girvan Mains Farm. All three microburins are proximal. Scale = 10mm. © Alice Watterson used with permission.

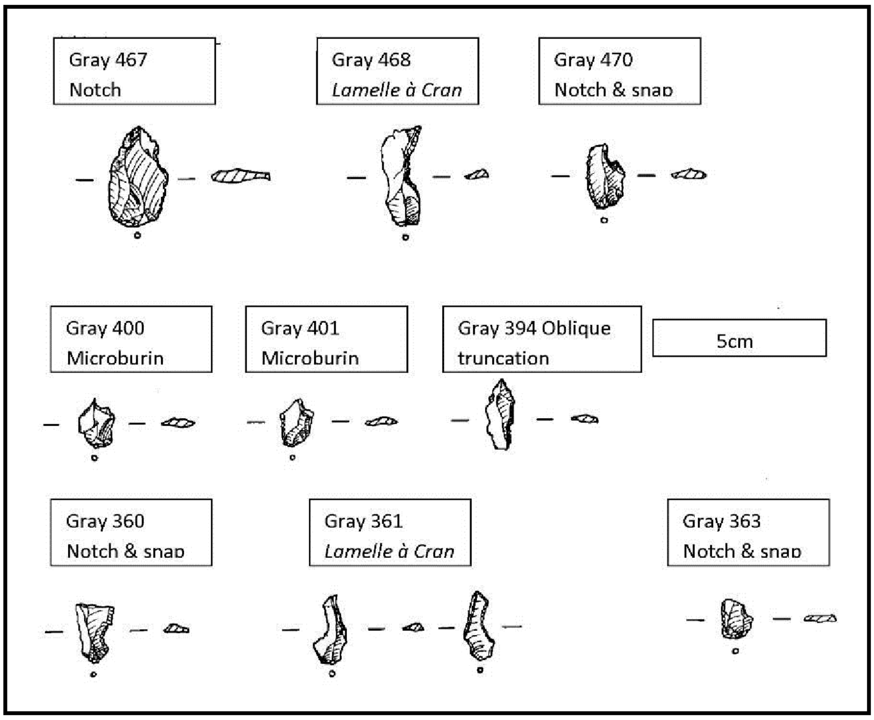

Figure 5.21: Illustration of selected artefacts from Gray's Ballantrae collection. © Alice Watterson used with permission.

5.3.1 Microliths

All of the microliths are flint except for a quartz backed bladelet from Girvan Mains Farm, which is only one of three water-rolled artefacts from the sampled assemblages. The numerical and percentage frequency of microlith types from Ballantrae and Girvan are shown at Table 5-20 and Figure 5.22. A quartz microlith was also recovered from Gallow Hill (Donnelly and MacGregor 2005, 50).

	Ballantrae	%	Girvan	%
Backed bladelets	9	39.13%	8	42.11%
Double backed bladelets	2	8.70%		
Crescent			1	5.26%
Scalene triangle	12	52.17%	7	36.84%
Needle Point			3	15.79%
	23		19	

Table 5-20: Numerical and percentage frequency of microliths from Ballantrae and Girvan.

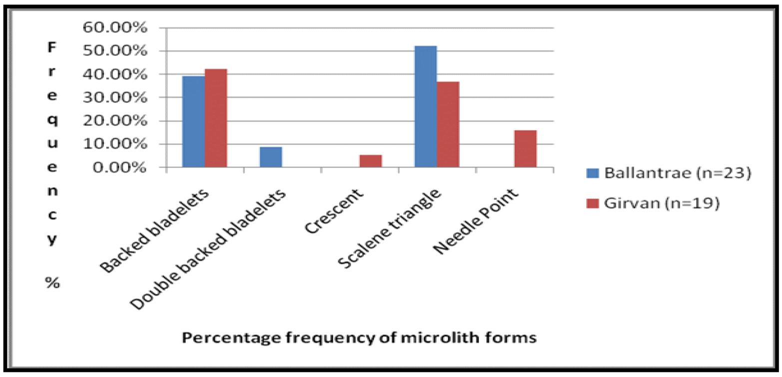

Figure 5.22: Percentage frequency of microlith forms from Ballantrae and Girvan.

52.17% of complete microliths from Ballantrae are scalene triangles, with the remainder comprising of backed and double backed bladelets (47.83%). The diversity of microliths from Girvan is more varied with backed bladelets most common at 42.11%, followed by scalene triangles 36.84%, needle points 15.29% and crescents 5.26%. To consider differential patterning three points must be considered. Firstly, the datasets from Ballantrae and Girvan are small for statistical analysis. Secondly, Finlayson (2004, 224) remarked that the only difference between scalene triangles and crescents is the angularity. This close continuity of form is even less marked when the sub-angular attribute of scalene triangles is acknowledged. This attribute is noted on five scalene triangles from

Ballantrae (41.66%) and three from Girvan (42.86%). Thirdly, those microlith fragments where type is established must be considered. Backed bladelets, including the double backed variant, represent 55.17% of microlithic forms from Ballantrae; backed bladelets from Girvan 45.00%. Scalene triangles account for 44.83% of microliths from Ballantrae with crescents and scalene triangles from Girvan at 40.00% (Figure 5.23). The presence of needle points at Girvan sets the assemblages apart, with one each from Girvan Golf Course, Gallow Hill and Girvan 1.

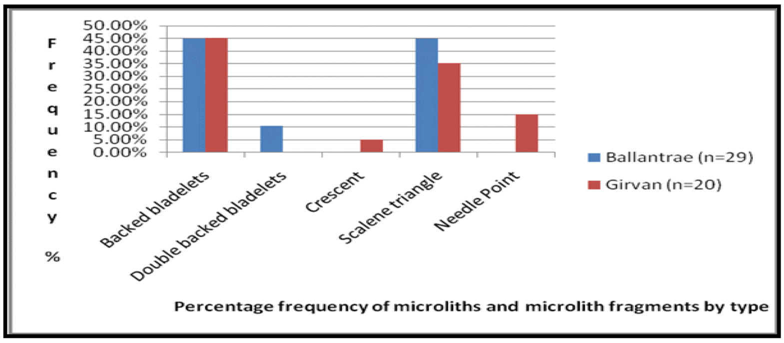

Figure 5.23: Percentage frequency of microliths and microlith fragments by type from Ballantrae and Girvan.

71.43% of the Girvan scalene triangles were collected the Golf Course, with the majority of backed bladelets (55.55%) from Girvan Mains Farm. It is possible that this represents differential task areas. The datasets from the excavations at Gallow Hill (Donnelly and MacGregor 2005, 51) and Littlehill Bridge (MacGregor and Donnelly 2001, 8) are even smaller than those from the surface collections and do not add anything to the analysis, except for the diversity of microlith forms present and Gallow Hill Area 4 where backed bladelets dominated (Donnelly and MacGregor 2005, 52), which corresponds to the evidence from Girvan Mains Farm.

5.3.2 Microlith attributes

The attribute analysis of microliths is shown at Table 5.21.

		Ballantrae	%	Girvan	%
Curvature Dorsal					
Straight		5	21.74%	2	10.53%
Irregular		6	26.09%	9	47.37%
Curved				1	5.26%
Sub-angular		5	21.74%	3	15.79%
Angular		7	30.43%	4	21.05%
		23		19	
Curvature Ventral					
Straight		5	21.74%	2	10.53%
Irregular		6	26.09%	9	47.37%
Curved				1	5.26%
Sub-angular		5	21.74%	3	15.79%
Angular		7	30.43%	4	21.05%
Angle Position					
None		11	47.83%	12	47.83%
Bottom Quarter		9	39.13%	3	39.13%
Top Quarter		3	13.04%	4	13.04%
Base					
Bulb Present		3	13.04%	4	21.05%
Break Snap		11	47.83%	7	36.84%
Angled/Curved		9	39.13%	8	42.11%
No. Of Retouched Edges					
	1	9	39.13%	7	36.84%
	2	10	43.48%	8	42.11%
	3	3	13.04%	4	21.05%
	4	1	4.35%		
Retouch Type					
Abrupt		15	65.22%	14	73.69%
Enclume		8	34.78%	4	21.05%
Semi-abrupt				1	5.26%
Point					
No point		22	95.65%	14	73.68%
Single Sided		1	4.35%	2	10.53%
Double Sided				3	15.79%
Raw Material					
Flint		23	100.00%	18	94.74%
Quartz				1	5.26%

Figure 5.24: Attribute analysis of microlith attributes from Ballantrae and Girvan.

5.3.2.1 Dorsal and ventral curvature

The percentage frequencies of the attributes for dorsal and ventral curvature are shown at Figures 5.25 and 5.26. The straight/irregular and angular/sub-angular attributes demonstrates the dominance of backed bladelets, double backed bladelets and needlepoints. The curved morphology refers to the one crescent from Girvan.

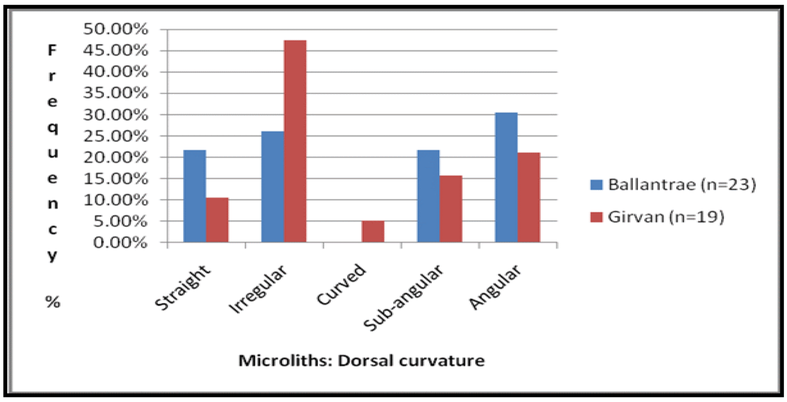

Figure 5.25: Percentage frequencies of shape of retouch to dorsal curvature.

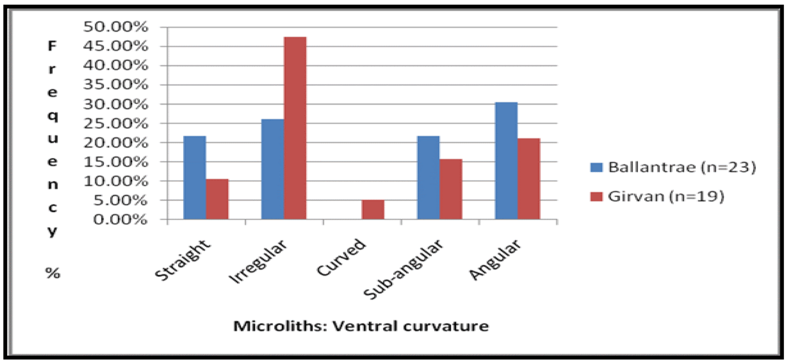

Figure 5.26: Percentage frequencies of shape of retouch to ventral curvature.

5.3.2.2 Angle position

The angle attribute speaks to the presence of scalene triangles. 75.00% of the microliths where an angled is recorded has the attribute located in the bottom quarter; Girvan 42.86%. A top quarter angle position is most common at Girvan 57.14%; Ballantrae 25.00% (Figure 5.27). This may indicate different individuals from possibly different hunter-groups making scalene triangles at Ballantrae and Girvan, or may suggest different periods of activity.

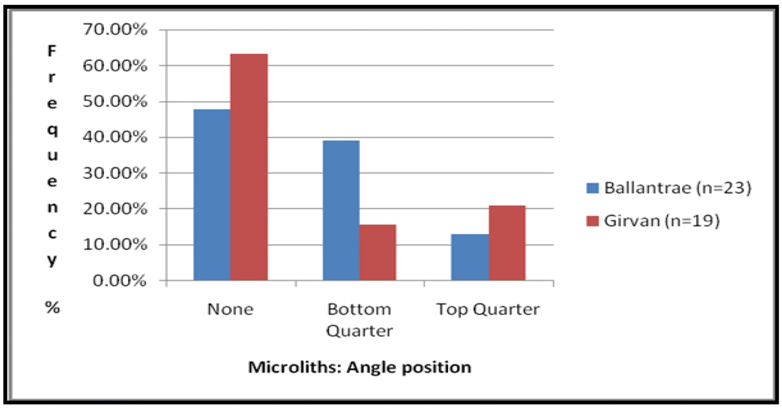

Figure 5.27: Percentage frequencies of angle position to microliths.

5.3.2.3 Basal morphology

The break snap was preferred at Ballantrae (47.83%); Girvan 36.84%. There is a marginally higher percentage frequency of retouch to the base of microliths recorded as an angled/curved attribute at Girvan 42.11%; Ballantrae 13.04%. The presence of the bulb of percussion on microliths from Ballantrae (13.04%) is low when compared to the data from Girvan (21.05%), which may signify different personal preference (Figure 5.28). It is interesting to note that comment is made on the retention of the bulb of percussion, although not quantified, on many of the backed bladelets from Gallow Hill (Donnelly and MacGregor 2005, 52).

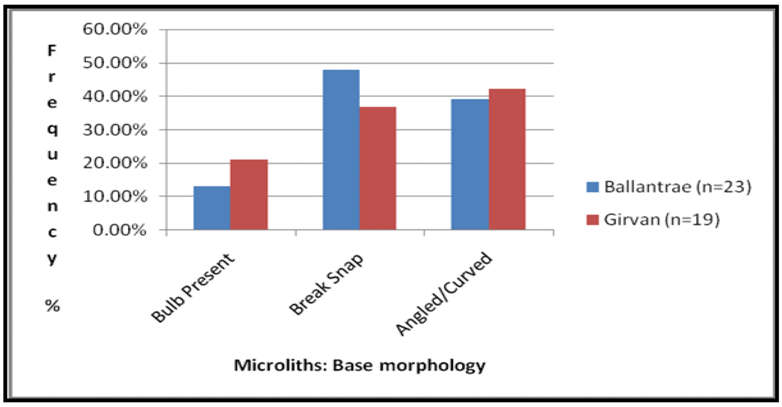

Figure 5.28: Percentage frequencies of basal forms to microliths.

5.3.2.4 Number of retouched edges

Apart from the one microlith with all four deemed edges with retouch, there are common differences in the profile of the number of edges with retouch (Figure 5.29). The profile may be said to follow the type analysis of the microlithic assemblages, although there is a potentially stronger case for common differences in technological practice where the extent of retouch is the minimal to replicate the piece to a conceptual design.

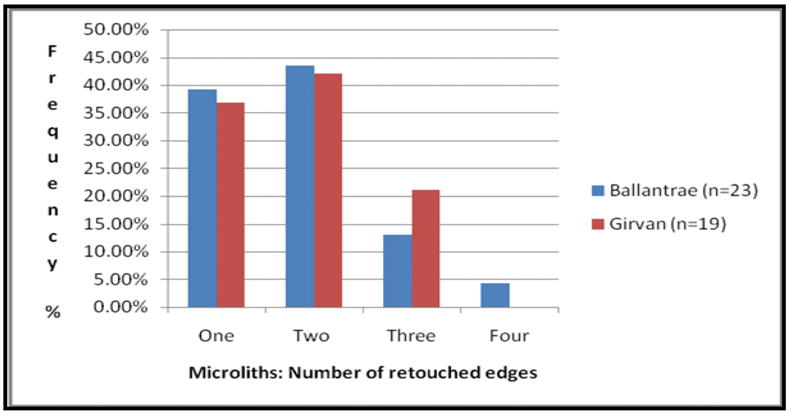

Figure 5.29: Percentage frequencies of the number of retouched edges to microliths.

5.3.2.5 Point character

The single sided points comprise of one backed bladelet from Ballantrae and two backed bladelets and one crescent from Girvan. The double sided points refer to the three needle points collected at Girvan (Figure 5.30).

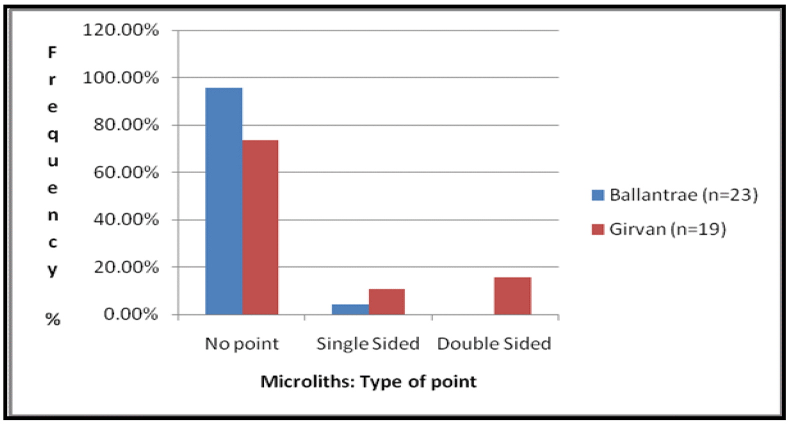

Figure 5.30: Percentage frequencies of the point character of microliths.

5.3.2.6 Type of retouch

97.62% of microliths have either abrupt or *enclume* retouch (Figure 5.31). It is not surprising to find that an anvil to support *enclume* retouch has not been used for microliths of more than 1mm in thickness. The majority of pieces with abrupt retouch occur within a thickness range of 1-2mm. There is a greater percentage frequency for *enclume* where the thickness of the microlith is 3-4mm (Table 5-21). The pressure required for retouch without using an anvil where the microlith blank is 2mm or greater is considerable (after Finlay 2006a, 308). This may suggest task variation by sex and/or age.

	Total	%	Ballantrae	%	Girvan	%
Thickness						
Abrupt						
1mm	13	44.83%	8	53.33%	5	35.71%
2mm	14	48.28%	5	33.33%	9	64.29%
3mm	2	6.89%	2	13.33%		
Enclume						
2mm	7	58.33%	6	66.67%	1	33.33%
3mm	4	33.33%	2	22.22%	2	66.67%
4mm	1	8.33%	1	11.11%		

Table 5-21: Numerical and percentage frequencies of type of retouch by microlith thickness

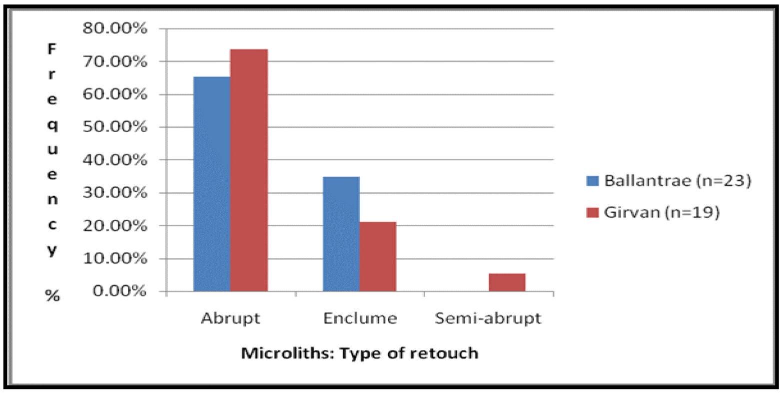

Figure 5.31: Percentage frequencies of microliths by type of retouch.

5.3.2.7 Size dimension

The mean metric data shows that microliths from Girvan are marginally larger than those from Ballantrae, which is also reflected in the modes (Table 5-22; Figure 5.32). The difference in the average length of platform blades to microliths is 12.65mm for Ballantrae; Girvan 8.77mm. This provides further evidence that microliths were manufactured at Ballantrae and Girvan.

Ballantrae			
(n=23)	L mm	W mm	Th mm
Maximum	23	7	3
Minimum	7	3	1
Average	12.3	4.61	1.83
STDEV	3.66	1.37	0.72
Mode	11	3	2
Girvan			
(n=19)	L mm	W mm	Th mm
Maximum	23	9	5
Minimum	10	3	1
Average	14.74	5.26	2.11
STDEV	4.01	1.57	1.05
Mode	13	5	2

Table 5-22: Size dimensions of microliths.

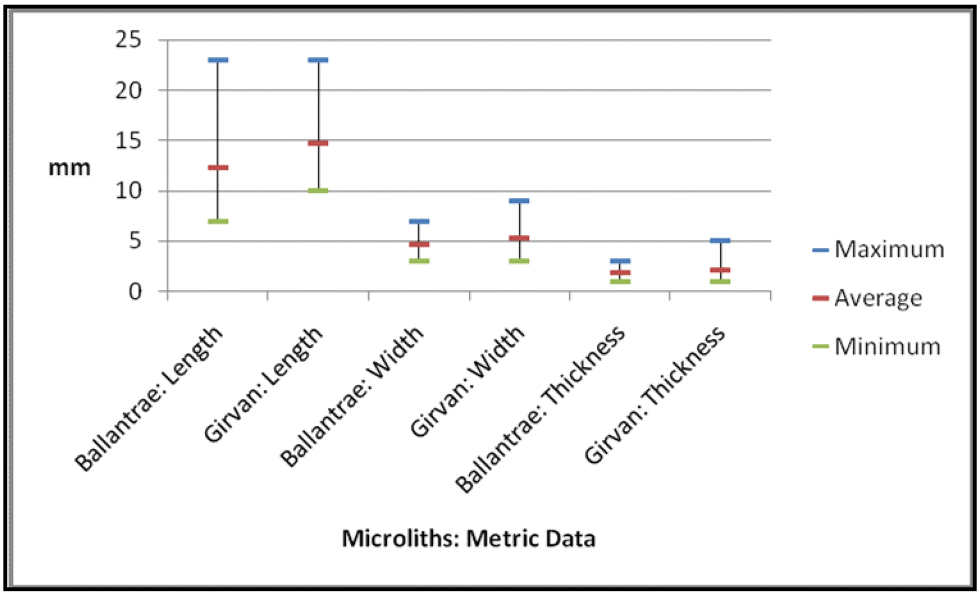

Figure 5.32: Metric data from the analysis of microliths.

5.3.2.8 Scalene triangles

The notes on the vagaries of the classification of scalene triangles in the previous Chapter are relevant here. 57.89% have angular attributes; sub-angular 42.11%. It is most common to find the angle featuring in the bottom quarter of the artefacts (63.16%); top quarter 36.84%. There is only one scalene triangle with a bulb of percussion. A retouched angled basal attribute has occurrence of 73.68%; break snap 21.05%. 73.68% of the artefacts have retouch to two edges. Direct abrupt retouch dominates on 14 of the 19 microliths (73.68%); *enclume* 21.05% and semi-abrupt 5.26%.

5.3.2.9 Backed bladelets

64.71% have an irregular dorsal and ventral curvature; straight 35.29%. The highest frequency for basal morphology is the break snap at 70.59%, followed by the presence of a bulb of percussion 23.53% and angled retouch 5.88%. Retouch to one edge is recorded on all but one of the backed bladelets which retouch to two edges. 52.94% of the artefacts have abrupt retouch; *enclume* 47.06%.

5.3.2.10 Needle points

Three of the 42 (7.14%) are needle points. Two pieces have retouch to more than two sides. There is an angled retouch basal morphology to two, and a break snap to the other. All have abrupt retouch.

5.3.2.11 Double backed bladelets

Both double backed bladelets have an irregular dorsal and ventral curvature profile. A bulb of percussion is present on one with a break snap basal morphology to the other. Abrupt retouch to two edges is common to both pieces.

5.3.2.12 Crescent

The crescent has a curved dorsal and ventral curvature profile, the bulb of percussion present and abrupt retouch to three edges.

5.3.3 Microlith fragments

There are only seven microlith fragments in total from the assemblages where type can be ascertained. Backed bladelets are most common with five, and one example each of a double backed bladelet and scalene triangle. Due to size of the dataset, it is impossible to draw any sustainable conclusion, although a table of the attributes may be found at Table 5-23 for completeness.

Medial fragments are most common at 45.45%, where it is possible to determine fragment type, followed by distal 27.27% and medial and distal 18.18%. Break snaps dominate the basal morphology with only one fragment retaining a bulb of percussion. Where lateralisation can be ascertained, the location of retouch strongly favours the right dorsal side (75.00%).

All of the breaks to microlith fragments are as a result of a snap/bending fracture, which in all but one of the artefacts is considered to have occurred during the manufacturing process. The exception is due to post-depositional breakage.

	Ballantrae	%	Girvan	%		Ballantrae	%	Girvan	%
Fragment type					**Break description**				
Indeterminate	2	20.00%			Snap/bending fracture	10	100%	3	100%
Proximal fragment	1	10.00%							
Distal fragment	3	30.00%			**Type of break**				
Medial fragment	3	30.00%	2	66.67%	Straight	6	60.00%		
Medial and distal	1	10.00%	1	33.33%	Angled	3	30.00%	2	66.67%
					Combination	1	10.00%	1	33.33%
Base Morphology									
Bulb present	1	10.00%			**Direction of break**				
Break snap	9	90.00%	2	66.67%	Retouched edge	10	100%	2	66.67%
Retouch (angled/curved)			1	33.33%	Indeterminate			1	33.33%
No. of retouched sides					**Reason for break**				
1	7	70.00%			Post-depositional			1	33.33%
2	3	30.00%	3	100%	Manufacture	10	100%	2	66.67%
Location of retouch					**EDMLE**				
Indeterminate	3	30.00%	2	66.67%	No	10	100%	3	100%
Right dorsal lateral side	6	60.00%							
Left dorsal lateral side	1	10.00%	1	33.33%	**EDIMLE**				
					No	10	100%	3	100%
Type hierarchy									
Backed one side	7	70.00%	1	33.33%	**Microlith type**				
Backed one side to point	1	10.00%			Indeterminate	4	40.00%	2	66.67%
Backed both sides	1	10.00%	2	66.67%	Backed bladelets	4	40.00%	1	33.33%
2 edges, angled/curved	1	10.00%			Double backed bladelets	1	10.00%		
					Scalene triangles	1	10.00%		
No. of breaks									
1	6	60.00%	1	33.33%					
2	4	40.00%	2	66.67%					
Break location									
Proximal			1	33.33%					
Lateral retouched	4	40.00%							
Combination	6	60.00%	2	66.67%					

Table 5-23: Attribute analysis of microlith fragments.

5.3.4 Truncations

118 truncations were collected from Ballantrae (54.24%) and Girvan (45.76%). Overall, oblique truncations have the greatest percentage occurrence at 54.24%,

followed by notch and snaps 32.20%, microburins 8.48% and *lamelle à cran* 5.08% (Table 5-24).

A distinct pattern emerges in the assemblages from Ballantrae and Girvan. Oblique truncations are most common at Girvan [66.67%] (see also Donnelly and MacGregor 2005, 52) with notch and snap truncations at Ballantrae (45.31%). Although there are fewer microburins recovered from Ballantrae it is possible that higher numerical and percentage frequency of notch and snaps may indicate an increase intensity of microlith production.

	Total	%	Ballantrae	%	Girvan	%
Oblique truncation	64	54.24%	28	43.75%	36	66.67%
Lamelle à cran	6	5.08%	3	4.69%	3	5.55%
Microburin	10	8.48%	4	6.25%	6	11.11%
Notch and snap	38	32.20%	29	45.31%	9	16.67%
	118		64		54	

Table 5-24: Analysis of truncations by type.

	Total	%	Ballantrae	%	Girvan	%
Truncation type						
Retouched	118	100.00%	64	100.00%	54	100.00%
Extent of retouch						
None	4	3.39%	4	6.25%		
Partial	55	46.61%	31	48.44%	24	44.44%
Complete	59	50.00%	29	45.31%	30	55.56%
End truncated						
Indeterminate	7	5.93%	5	7.81%	2	3.70%
Proximal	47	39.83%	24	37.50%	23	42.59%
Distal	64	54.24%	35	54.69%	29	53.71%
Side						
Indeterminate	15	12.71%	9	14.06%	6	11.11%
Left	48	40.68%	25	21.86%	23	42.59%
Right	55	46.61%	30	46.88%	25	46.30%
Bulb of percussion						
Absent	64	54.24%	31	48.44%	33	61.11%
Present	54	45.76%	33	51.56%	21	38.89%
Notch						
Absent	65	55.09%	29	45.31%	36	66.67%
On part of truncation	34	28.81%	18	28.13%	16	29.63%
Below, separate	19	16.10%	17	26.56%	2	3.70%
Backed						
Yes	73	61.86%	25	39.06%	48	88.89%
No	45	38.14%	39	60.94%	6	11.11%
Any other retouch						
Yes	16	13.56%	7	10.94%	9	16.67%
No	102	86.44%	57	89.06%	45	83.33%
Opposable Burin blow						
Yes	1	0.85%			1	1.85%
No	117	99.15%	64	100.00%	53	98.15%

Table 5-25: Attribute analysis of truncations.

5.3.4.1 Oblique truncations

The comparison of oblique truncations from Ballantrae and Girvan determines that there are marked common differences in the attribute profiles (Table 5-26). A right hand lateralisation for the shortest side of oblique truncations distinguishes Ballantrae (62.50%) from Girvan (47.06%). The mean metric data shows that the size dimensions of artefacts from Ballantrae are marginally greater across all three measured parameters (Table 5-27).

Oblique truncations	Ballantrae	%	Girvan	%
Truncation type				
Retouched	28	100.00%	36	100.00%
Extent of retouch				
None				
Partial	1	3.57%	6	16.67%
Complete	27	96.43%	30	83.33%
End truncated				
Indeterminate				
Proximal	15	53.57%	18	50.00%
Distal	13	46.43%	18	50.00%
Side				
Indeterminate	4	14.29%	2	5.56%
Left	15	53.57%	16	44.44%
Right	9	32.14%	18	50.00%
Bulb of percussion				
Absent	18	64.29%	24	66.67%
Present	10	35.71%	12	33.33%
Notch				
Absent	26	92.86%	36	100.00%
On part of truncation				
Below, separate	2	7.14%		
Backed				
Yes	21	75.00%	36	100.00%
No	7	25.00%		
Any other retouch				
Yes	7	25.00%	8	22.22%
No	21	75.00%	28	77.78%
Opposable Burin blow				
Yes			1	2.78%
No	28	100.00%	35	97.22%

Table 5-26: Attribute analysis of oblique truncations.

Ballantrae				Girvan			
(n=28)	L mm	W mm	Th mm	(n=36)	L mm	W mm	Th mm
Maximum	38	20	7	Maximum	30	18	3
Minimum	7	4	1	Minimum	9	3	1
Average	19.96	9.11	3.04	Average	16.49	8.51	2.35
STDEV	7.37	3.82	1.29	STDEV	4.43	3.04	0.68
Mode	19	6	2	Mode	17	8	3

Table 5-27: Size dimensions of oblique truncations.

5.3.4.2 Notch and snap

The paucity of notch and snap truncations from Girvan makes meaningful comparison difficult. The relatively high occurrence of these forms at Ballantrae is particularly interesting. The observation that they are closely related to microburins was made in the secondary technology analysis for the *SHMP* (Finlay *et al.* 2000a, 579). The majority of the artefacts from Ballantrae are distal truncations (58.62%), where the truncated end of the blank could be established. Proximal and distal truncations equate at Girvan. The dominance of distal truncation is anomalous where comparison is made to the data set from the *SHMP* (*ibid*, 579). Lateralisation favours the right hand side at Ballantrae (62.07%), a position that is reversed at Girvan. Left lateralisation is recorded on 66.67% of proximal truncations from Ballantrae; right 33.33%. The position is reversed for distal truncations; left 17.65% and right 82.35% (Table 5-29).

48.28% of the artefacts have the notch below or separate to the truncation. Following Finlay *et al.* (*ibid*, 579), it appears that the removal of an irregular distal end was an intentional strategy. Where the notch is part of the truncation it is possible that the snap is as a result of error; effectively a failed microburin.

The recovery locations/collections for notch and snap truncations from Ballantrae are shown at Table 5-28.

Notch & snap	Total	%	Proximal	%	Distal	%
Edgar	13	44.83%	6	50.00%	7	41.18%
Gray Site 4	2	6.90%	1	8.33%	1	5.88%
Gray Site 5	12	41.37%	4	33.34%	8	47.06%
Muirfield	2	6.90%	1	8.33%	1	5.88%
	29		12		17	

Table 5-28: Analysis of sites where notch and snaps truncations were recovered.

Notch & snap	Ballantrae	%	Girvan	%
Truncation type				
Retouched	29	100.00%	9	100.00%
Extent of retouch				
None	4	13.79%		
Partial	25	86.21%	9	100.00%
Complete				
End truncated				
Indeterminate	3	10.35%	1	11.11%
Proximal	9	31.03%	4	44.44%
Distal	17	58.62%	4	44.45%
Side				
Indeterminate	4	13.79%	1	11.11%
Left	9	31.03%	5	55.56%
Right	16	55.18%	3	33.33%
Bulb of percussion				
Absent	12	41.38%	6	66.67%
Present	17	58.62%	3	33.33%
Notch				
Absent				
On part of truncation	15	51.72%	8	88.89%
Below, separate	14	48.28%	1	11.11%
Backed				
Yes	2	6.90%	6	66.67%
No	27	93.10%	3	33.33%
Any other retouch				
Yes			1	11.11%
No	29	100.00%	8	88.89%
Opposable Burin blow				
Yes				
No	29	100.00%	9	100.00%

Table 5-29: Attribute analysis of notch and snap truncations.

Ballantrae (n=29)	L mm	W mm	Th mm	Girvan (n=9)	L mm	W mm	Th mm
Maximum	24	17	4	Maximum	18	12	3
Minimum	8	6	1	Minimum	11	5	1
Average	15.34	9.76	2.83	Average	13.56	8.22	2.11
STDEV	4.71	2.71	0.85	STDEV	2.35	2.17	0.6
Mode	18	7	3	Mode	13	8	2

Table 5-30: Size dimensions of notch and snap truncations.

5.3.4.3 Microburins

Generally, the morphology of microburins is analogous, and the evidence from Ballantrae and Girvan does not disturb this notion (Table 5-31). The uniformity of the microburin makes it difficult to distinguish one person from another. The profound common differences for two microburins (400; 401) from Gray Site 5, Ballantrae suggest the work of one person. Right lateralisation is statistically exclusive.

The percentage frequency of proximal microburins (66.67%) from Gallow Hill (Donnelly and MacGregor 2005, 51) equates to the frequencies from the surface collections from Ballantrae and Girvan. It appears that there is a higher incidence of left lateralisation for the notch at Gallow Hill (*ibid*, 51). The one microburin from Littlehill Bridge has a right lateralisation (MacGregor and Donnelly 2001, 9).

5.3.4.4 *Lamelle à Cran*

Six *lamelle à cran* were recovered from Ballantrae and Girvan, three from each location. In considering the whole population the truncation of the distal end is favoured in preference to the proximal end. All of other attributes equate. There are variations between Ballantrae and Girvan in respect of which end is truncated, the location of the notch and lateralisation (Table 5-31). The dataset is not robust enough to draw any meaningful conclusions. However, the variances may indicate different preferences for more than one person at both locations. The width range from Ballantrae and Girvan, and the length range for Girvan fall within the parameters for *lamelle à cran* from Bolsay Farm (after Finlay *et al*. 2000a, 580). The maximum length of the Ballantrae artefacts is greater than those from Bolsay Farm [*ibid*] (Table 5-32).

Microburins	Ballantrae	%	Girvan	%	*Lamelle à cran*	Ballantrae	%	Girvan	%
Truncation type					**Truncation type**				
Retouched	4	100.00%	6	100.00%	Retouched	3	100.00%	3	100.00%
Extent of retouch					**Extent of retouch**				
None					None				
Partial	2	50.00%	6	100.00%	Partial	3	100.00%	3	100.00%
Complete	2	50.00%			Complete				
End truncated					**End truncated**				
Indeterminate					Indeterminate				
Proximal	1	25.00%	1	16.67%	Proximal			1	33.33%
Distal	3	75.00%	5	83.33%	Distal	3	100.00%	2	66.67%
Side					**Side**				
Indeterminate					Indeterminate				
Left			1	16.67%	Left	1	33.33%	2	66.67%
Right	4	100.00%	5	83.33%	Right	2	66.67%	1	33.33%
Bulb of percussion					**Bulb of percussion**				
Absent	1	25.00%	2	33.33%	Absent			1	33.33%
Present	3	75.00%	4	66.67%	Present	3	100.00%	2	66.67%
Notch					**Notch**				
Absent	2	50.00%			Absent				
On part of truncation	2	50.00%	6	100.00%	On part of truncation	1	33.33%	2	66.67%
Below, separate					Below, separate	2	66.67%	1	33.33%
Backed					**Backed**				
Yes					Yes				
No	4	100.00%	6	100.00%	No	3	100.00%	3	100.00%
Any other retouch					**Any other retouch**				
Yes					Yes				
No	4	100.00%	6	100.00%	No	3	100.00%	3	100.00%
Opposable Burin blow					**Opposable Burin blow**				
Yes					Yes				
No	4	100.00%	6	100.00%	No	3	100.00%	3	100.00%

Table 5-31: Attribute analysis of microburins and *lamelle à cran*.

Microburin							
Ballantrae				**Girvan**			
(n=4)	**L mm**	**W mm**	**Th mm**	(n=6)	**L mm**	**W mm**	**Th mm**
Maximum	13	9	3	Maximum	20	14	3
Minimum	7	3	1	Minimum	9	7	2
Average	10.5	7	2	Average	15	9.83	2.17
STDEV	3	2.71	0.82	STDEV	3.9	2.4	0.41
Mode	13	8	2	Mode	N/A	9	2
Lamelle à cran							
Ballantrae				**Girvan**			
(n=3)	**L mm**	**W mm**	**Th mm**	(n=3)	**L mm**	**W mm**	**Th mm**
Maximum	35	10	3	Maximum	25	9	4
Minimum	19	9	2	Minimum	16	5	1
Average	27	9.33	2.67	Average	20	7.33	2.33
STDEV	8	0.58	0.58	STDEV	4.59	2.08	1.53
Mode	N/A	9	3	Mode	N/A	N/A	N/A

Table 5-32: Size dimensions of microburins and *lamelle à cran*.

5.3.5 Scrapers

The analysis of the grab samples suggests that there was a wide variety of scrapers at Ballantrae and Girvan (Table 5-33). The point has been made that scrapers are common artefacts in the assemblages of later prehistory (Finlay *et al*. 2000, 583), and it is possible that some of the artefacts may relate to post-Mesolithic activities. The analysis of the scrapers from Gallow Hill and Littlehill Bridge is rudimentary (Donnelly and MacGregor 2005, 52-53; MacGregor and Donnelly 2001, 8) and makes meaningful comparison impossible.

Convex forms are most common at Ballantrae (38.39%) and Girvan (52.38%), followed by angled variants (Ballantrae 36.61%; Girvan 28.57%). 12.50% of scrapers from Ballantrae are straight; Girvan 7.14%. The percentage frequency of denticulates is greater at Girvan 14.29%; Ballantrae 8.04%.

The relationship of convex to thick convex may indicate task differentiation. The ratio of convex to thick convex is 3.78:1 at Ballantrae; Girvan 2.66:1. It is possible that part of variation in the ratios is a result of sample bias. In the absence of use-wear analysis, if any conclusion is to be offered then it may be that the mix of convex and thick convex broadly equate tentatively suggesting common differences in the tasks undertaken using these forms at Ballantrae and Girvan.

Angled and sub-angled scrapers are also common in Mesolithic assemblages, e.g. they have the highest incidence of occurrence at Kinloch, Rùm (Wickham-Jones and McCartan 1990, 91).

	Ballantrae	%	Girvan	%
Short convex	20	17.86%	8	19.05%
Short convex flared	8	7.14%	6	14.29%
Short thick convex	8	7.14%	4	9.52%
Short thick convex flared	1	0.89%		
Long convex	1	0.89%		
Long convex flared	2	1.80%		
Long thick convex			1	2.38%
Long thick convex flared			1	2.38%
Denticulate	9	8.04%	6	14.29%
Angled	19	16.96%	1	2.38%
Sub-angled	22	19.64%	9	21.43%
Straight	14	12.50%	3	7.14%
Wide convex	3	2.68%	2	4.76%
Irregular	1	0.89%		
Fragments	4	3.57%	1	2.38%
	112		42	

Table 5-33: Numerical and percentage frequencies of scrapers by type.

5.3.6 Other forms of retouched artefacts

Other retouched forms represent 16.05% of modified artefacts from Ballantrae. Notches are most common at 4.42%, followed by abruptly and thin backed forms. Denticulates, awls and points are rare. Apart from one notch all of the other forms can be classified by having miscellaneous retouch. The percentage occurrence of miscellaneous retouch statistically equate for Ballantrae and Girvan (Figure 5.33). The retouch is rudimentary, although the character distinguishes those from later periods.

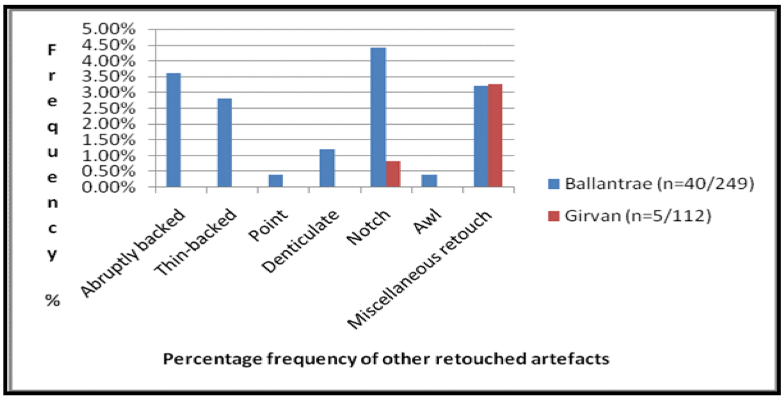

Figure 5.33: Percentage frequencies of other retouched artefacts.

5.3.7 Edge Damage

The classification of edge damage through use is particularly difficult because the assemblages are generally surface collections from the plough zone. Guidance is given by experimental studies for damage caused by ploughing (Mallouf 1982) and trampling (McBrearty *et al.* 1998). There are 100 unretouched artefacts recorded as edge damaged at Ballantrae, of which 87 are post-depositional probably caused by the abrasions of ploughing over a sustained period. It may be argued that only six blades and seven flakes could be said to edge damaged through use on the basis of macroscopic criteria alone. A similar situation is noted at Girvan. 64 of 72 artefacts have edge damage which may be attributed to either ploughing, or some other similar abrasive taphonomic practice. Three flakes and five blades may have use-induced edge damage.

Apart from scrapers none of the artefacts with secondary modification have any attributes that would categorically place them within a use-wear classification.

5.3.8 Discussion

Platform and bipolar reduction strategies were employed at Ballantrae and Girvan. Anvil support suggests that these strategies were coeval, although that does not preclude some bipolar activity may relate to distinctive activities undertaken during the Mesolithic period and possibly later. Indirect percussion is considered to have been used in the production of flakes from Gallow Hill Area 2 (Donnelly and MacGregor 2005, 57). Following Sørensen (2006; Figure 9), none of the artefacts, either analysed or scoped revealed any firm evidence for the use of indirect percussion routinely.

The data from the technological analysis of primary technologies indicates the presence of blade industries at Ballantrae and Girvan. The presence of microburins and notch and snaps suggests the manufacture of microliths. The mean size dimensions of blades compared to the corresponding data for microliths provides proxy evidence for the local production of microliths. There are common differences in the profile of the microlithic assemblages at Ballantrae and Girvan, for example the percentage frequencies of backed bladelets equate, although scalene triangles are more common at Ballantrae it is only at Girvan where needle points and crescents have been recovered. The microlithic assemblages fall within the Smittons Group (see Chapter 7 for a full discussion), and on Finlayson's (1989, 201) tentative interpretation Ballantrae and Girvan would be locations where a wide range of activities were undertaken.

There were more microburins recovered from Girvan, although there are fewer microliths. However, if notch and snap truncations, where the notch is situated on part of the truncation, are factored in then the balance is redressed. This assumes that some or all of the notch and snap truncations are errors occurring during the microburin strategy.

In contrast to the island palimpsests, the relatively low number of microliths is not necessarily uncommon in West Central and South West Scotland and may be part of the character of coastal occupation during the Mesolithic period (Donnelly and MacGregor 2005, 52). The possible reasons and factors for the relative paucity of microliths are explored in Chapter 8.

Scrapers as an absolute percentage of artefacts with secondary modification are understated. Unlike the other tool forms, the scrapers subjected to technological analysis are grab samples. It is considered that because of the number of artefacts analysed they are broadly representative of the variant profile available from Ballantrae and Girvan. The ratios of convex to thick convex suggest the possibility of broad common differences in utilisation. Ballantrae can be differentiated from Girvan in the percentage frequencies of angled, straight and denticulate scrapers.

It may be argued that the clearest distinction between the assemblages relates to the profile of truncations and other tool forms. The ratio of oblique truncations for Ballantrae to Girvan is 1:1.29, and notch and snap truncations, where the notch is separate to the truncation, is 1:0.07. This form of truncation should be regarded as an intentional strategy (Finlay *et al*. 2000a, 579). The data from Table 5-18 determines that the ratio of other tool forms for Ballantrae to Girvan is 1:0.025. It is probable that these variances in the profiles for scrapers, oblique truncations, one form of notch and snap truncations and other tool types may represent not only task differentiation but could also relate different temporal events.

5.4 Summary

The statistically exclusive utilisation of small/medium flint beach and riverine pebbles is common to Ballantrae and Girvan. The reduction strategies do offer contradictory evidence. The limited evidence from blanks for the use of an anvil support technique for platform cores implies the contemporaneous employment of bipolar and platform reduction strategies. Bipolar reduction was used to open flint pebbles some of which would then be fashioned into platform cores. This highlights adaptive practice for bipolar and platform strategies. In contrast, there is no evidence for the use of the bipolar technique to extend the working life of platform cores. There are common differences in the predominant use of simple platforms, soft hammerstones, core rejuvenation strategies and the intensive working of cores.

The technological analysis confirms the presence of blade industries at Ballantrae and Girvan which corresponds to the conclusions in the excavation reports from Gallow Hill (Donnelly and MacGregor 2005, 56) and Littlehill Bridge (MacGregor and Donnelly 2001, 7). There are common differences in core platform type and core preparation producing blades of a similar mean dimensions with a high percentage frequency of regularity. The common differences in the proximal profiles of blades suggest a conceptual schema for using the use of blade segments for retooling.

The forms of microliths recovered from Girvan Golf Course and Girvan Mains Farms may suggest the possibility of either task differentiation or different temporal events. The marked disparity between Ballantrae and Girvan lies in the presence of needle points at Girvan, although this may simply reflect collection bias. There is, however, a marked variation in the profile of truncations, especially notch and snap truncations where the notch is located below or separate to the truncation. The propensity of distal truncations is anomalous to comparable evidence from elsewhere. Unfortunately, the granularity of attribute analysis is generally so poor in published lithic reports that comparanda is restricted to the assemblages from the *SHMP*. It is possible that the relatively high percentage of platform blades with the distal end missing (Table 5-17) is perhaps further evidence for routine practice.

The assemblages from Ballantrae and Girvan provide further evidence for the continuity of technological practice during the Mesolithic period. A comparison with the assemblages from Gallow Hill (Donnelly and MacGregor 2005) and Littlehill Bridge (MacGregor and Donnelly 2001) generally show common differences in technological practice and indicate the efficacy of the sampling strategy. Unfortunately, the published lithic reports are no more than overviews and fine grained comparanda is simply not possible at the present time.

Chapter 6: Primary technology of lithic practice for inland events in South Ayrshire and South Lanarkshire during the Mesolithic period

6.1 Introduction

The focus of this chapter is the primary technology of the excavated assemblages and surface collections representing inland events of South Ayrshire and South Lanarkshire. This represents those stages of the *chaîne opératoire* from the procurement of raw material to the production of debitage products. The technological and typological analysis has been undertaken to determine intra-site, inter-site and intra-region variability to ultimately construct an inter-regional profile (cf. Chapter 8).

The sites and the number of artefacts analysed are detailed at Table 6-1. A full analysis was carried out on all of the artefacts except for the collections from Loch Doon, which was subject to a detailed typological analysis with a technological analysis on 121 artefacts; 91 cores and blanks (Section 4.6.1). It was not possible to either refit blanks to cores, or refit blanks. The assemblages from Starr 1 and Starr 2 offer insight into events at Loch Doon, although the available data is limited. Reference is also made to available information from Smittons (cf. Finlayson 1989; 1990; 1990a).

The section 6.2 on 'Raw Material' considers issues relating to the total number of artefacts analysed, including those with secondary modification. All other sections to this chapter deal exclusively with those artefacts classified as primary, i.e. cores and debitage products.

Tables of the attribute analysis of bipolar and platform cores and blanks, together with tables of size dimensions for bipolar and platform cores may be found at Appendix I. They have been taken out because the sheer volume, 29 tables was too great an interruption to the flow of the chapter.

Site(s)		
Excavated assemblages	**Total**	**Primary**
Climpy	785	744
Daer 84	1811	1700
Daer 85	1764	1652
Daer Reservoir 1 (sampled)	148	49
Daer Reservoir 2 (sampled)	63	15
Daer Reservoir 3 (sampled)	48	8
Weston (sampled)	1093	252
Surface collections		
Daer Reservoir: various locations (sampled)	52	35
Loch Doon	1894	1863
Powbrone	1471	1431
	9129	7749

Table 6-1: Analysis of sites and number of artefacts analysed.

6.2 Raw Material

The dominant raw material utilised at Climpy, Daer 84 and Daer 85 was chert with the incidence of flint varying from 2.61% at Climpy to 7.88% at Daer 85 (Table 6-2; Figure 6.1). Chert also features strongly at Powbrone (52.07%), although there is a marked increase in the use of flint (16.65%), quartzite (14.62%) and quartz (14.14%). The wider range of materials from Powbrone includes jasper, mudstone and pitchstone which were not found in the other three assemblages. Agate and chalcedony are minimally present at all of the sites except for Climpy. There are two cores and three modified pieces of siltstone in the assemblage from Daer 85. It is surprising that there are no debitage products, although this may not necessarily be due to recovery bias. The discard of these artefacts may indicate a distinct temporal episode relating to the activities of a different hunter-gatherer group.

Chert accounts for 46.99% of the collections from Loch Doon with the incidence of flint only marginally less at 45.21%. Worked quartz, siltstone and agate are present in minor quantities (Figure 6.1). 5.85% of the pieces from Loch Doon are chalcedony with almost half of them burnt. Finlayson (1989, 164) undertook a typological classification of the flakes, blades, chunks and cores from the surface collections and excavated assemblages from Starr 1 at Loch Doon showing that the percentile frequency of chert at 52.27%; flint 47.73%. The marginal percentage frequency favouring chert to flint follows the pattern of Ansell's surface collections.

Chert dominates the Weston assemblage at 92.58%; flint 6.82%. Other raw materials (0.60%) in order of frequency are quartz, pitchstone, agate, quartzite, siltstone, jasper and mudstone. 77.08% of the sampled assemblage from Weston is chert; flint 21.83%. Chert is also the most common type of raw material from Daer Reservoir, however, the sample analysed comprises principally of cores, tool form types and a number of debitage products with edge damage. The occurrence of chert in the sample is 33.54%; flint 60.56% (Figure 6.1). A number of pieces of the 'blue stone' have also been analysed (Figure 6.2). Archaeologists and geologists have examined this siliceous 'blue stone' and have been unable to identity its origin (Alan Saville pers. comm.).

	Climpy	%	Daer 84	%	Daer 85	%	Powbrone	%
Chert	783	97.27%	1759	97.13%	1606	91.04%	766	52.07%
Flint	21	2.61%	48	2.65%	139	7.88%	245	16.65%
Quartz	1	0.12%					208	14.14%
Quartzite			1	0.06%	7	0.40%	215	14.62%
Agate			1	0.06%	3	0.17%	17	1.16%
Chalcedony			1	0.05%	4	0.23%	1	0.07%
Jasper							4	0.27%
Mudstone							2	0.14%
Pitchstone							4	0.27%
Siltstone					5	0.28%		
Indeterminate			1	0.05%			9	0.61%

Table 6-2: Numerical and percentage frequencies of raw materials from Climpy, Daer 84, Daer 85 and Powbrone.

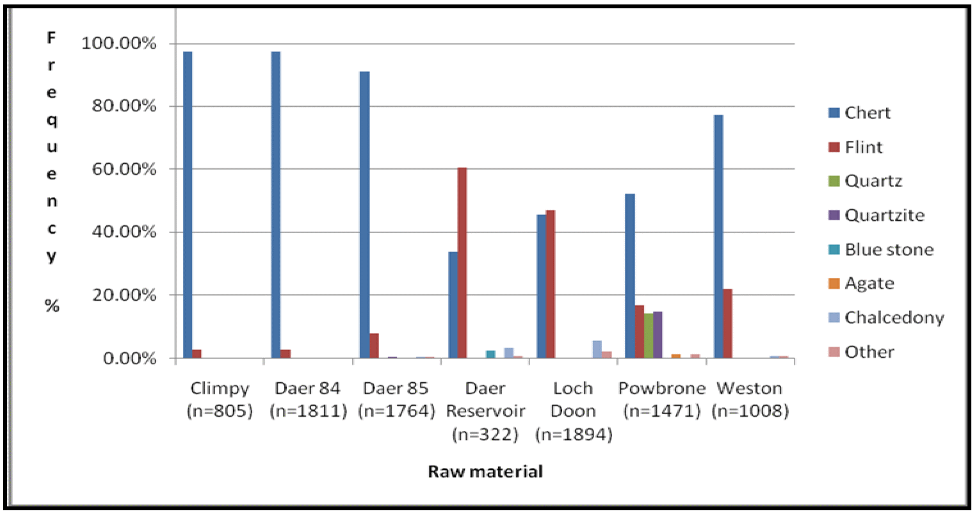

Figure 6.1: Percentage frequencies of raw materials from Climpy, Daer 84, Daer 85, Loch Doon and Powbrone and sampled artefacts from Daer Reservoir and Weston.

Figure 6.2: Blue stone artefacts from Daer Reservoir 1.

6.2.1 Colour of raw materials

Greenish grey and grey hues dominate the fresh chert components of the assemblages (Table 6-3; Figure 6.3). The same pattern is noted at Loch Doon. The percentage frequency of greenish greys from the analysis of 765 pieces of fresh chert from Weston is 66.01%; greys 23.53%. The incidences of brown hues at 6.67% and black 3.79% have a broad common difference to the occurrences from Climpy. However, the Daer Reservoir is unique in comparison to the other assemblages from the other sites. There are 107 pieces of fresh chert in the sampled assemblage of which 32.71% are greenish grey, with greys at 61.68%. The majority of the grey hued artefacts are bluish grey which is quite distinctive from the chert used at the other inland locations.

Predominantly grey hues of flint are noted at Climpy, Daer 84, Daer Reservoir and Weston, with higher incidences of brown hues from Daer 85, Powbrone and Loch Doon (Figure 6.4).

Chert	Climpy	%	Daer 84	%	Daer 85	%	Powbrone	%
Greenish greys	548	80.71%	1364	77.94%	1110	70.16%	546	76.36%
Greys	68	10.01%	354	20.22%	406	25.67%	145	20.28%
Browns	42	6.19%	14	0.80%	12	0.76%	19	2.66%
Black	21	3.09%	14	0.80%	54	3.41%	4	0.56%
Other			4	0.24%			1	0.14%
	679		1750		1582		715	

Table 6-3: Colour hues of fresh chert from Climpy, Daer 84, Daer 85 and Powbrone.

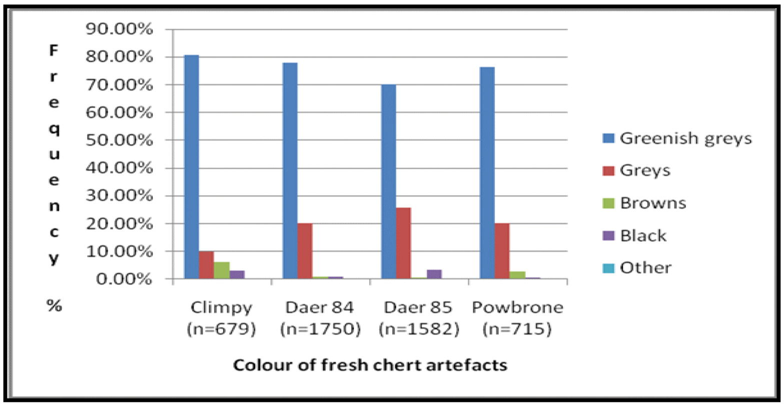

Figure 6.3: Percentage frequencies of general colour of fresh chert from Climpy, Daer 84, Daer 85 and Powbrone.

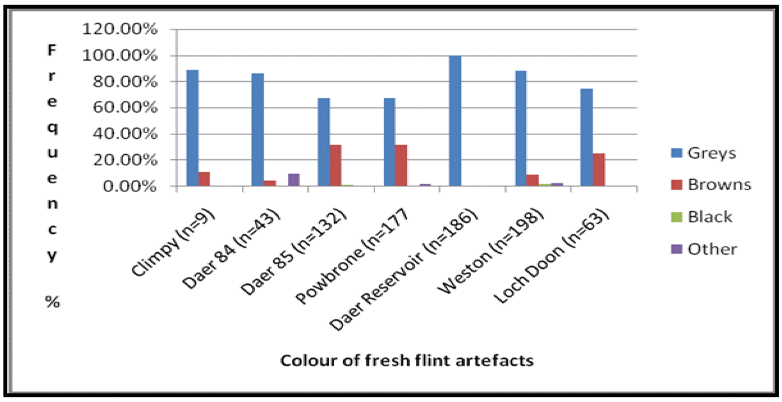

Figure 6.4: Percentage frequencies of general colour of fresh flint from Climpy, Daer 84, Daer 85, Powbrone, Daer Reservoir, Weston and Loch Doon.

6.2.2 Condition of the assemblages

The overwhelming majority of the pieces within the assemblages from Climpy, Daer 84, Daer 85 and Powbrone together with the sampled assemblages from Daer Reservoir and Weston are fresh (Figure 6.5). The percentage frequencies range from 86.34% for Powbrone to 99.12% for Daer 84. 89.99% of the chert and flint from Loch Doon is fresh, with 8.89% burnt. It has already been noted that a high proportion of the agate from Loch Doon was burnt. Elsewhere, the incidence of burnt pieces varies from 4.46% from Climpy to 0.79% from Daer 85.

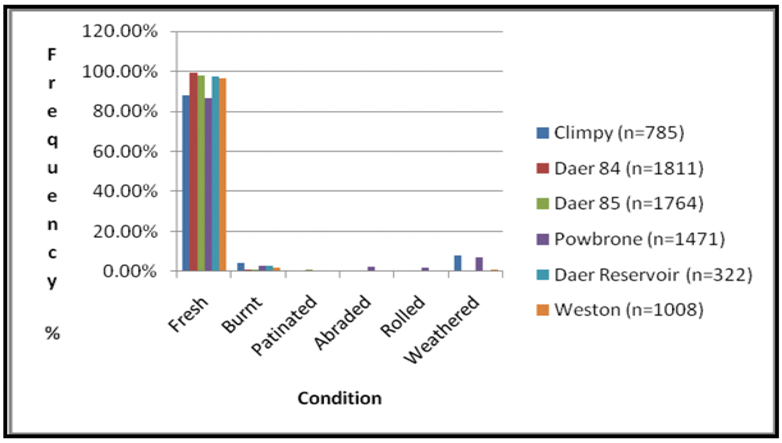

Figure 6.5: Percentage frequencies of the condition of artefacts from Climpy, Daer 84, Daer 85, Powbrone, Daer Reservoir and Weston.

6.2.3 Source of raw materials

Where sphericity can be recorded it is clear that the flint from the assemblages derives from secondary pebble sources. The flint may have been brought to the site having been collected from the beach, or harvested from local riverine and/or gravel locations. The situation for the chert is more complicated. As previously stated, the recovered chert is generally fresh in condition. The incidence of rolled chert is extremely low; Powbrone 1.56% and Daer 85 0.06% and, therefore, water abrasion cannot be a factor in the classification of the original cortical surface of the material (Figure 6.6). A smooth/hard cortex is noted on 94.95% of the chert from Climpy; Powbrone 82.14% and Daer 84 61.13%. This may suggest that chert was chosen from either outcrops of bedded chert, or pieces naturally fractured from those outcrops were collected for use. A different selection policy is noted at Daer 85 where 78.39% of the cortical surface is a smooth/chalky variant; Daer 84 24.55% and Powbrone 0.89%. This suggests the use of nodular chert eroding out of sandstones. Generally neither variant of chert exhibit water-rolled attributes.

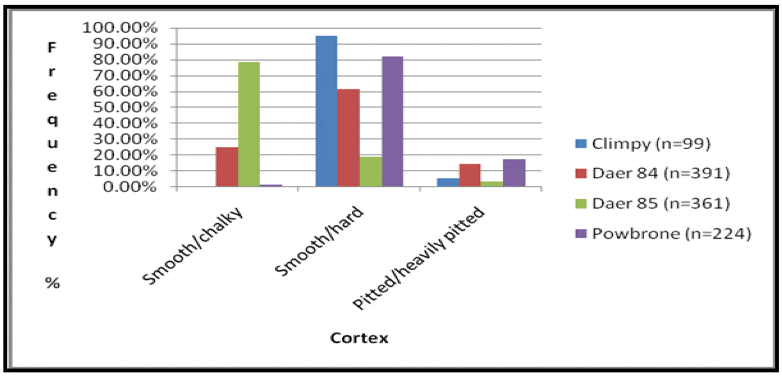

Figure 6.6: Percentage frequencies of cortical surface of chert by type.

6.3 Character of the assemblages

The character of the assemblages from Climpy, Daer 84, Daer 85 and Powbrone is shown at Table 6-4. Apart from Climpy the occurrences of types within the assemblages are inherently biased due to the poor recovery of small fraction debitage.

There is a paucity of primary flakes and blades (Figure 6.7). Primary chert flakes from Loch Doon at 2.66% contrasts with 17.80% for flint flakes. Analysis of Finlayson's (1989, 165) Starr 1 data shows that the percentage frequency of primary flakes at 4.35%; chert 2.81% and flint 5.83%. Data is not recorded for blades. The Ansell surface collections from Loch Doon show primary flakes at 10.58%, again with flint being more common than chert. 2.67% of blades are primary.

Although chert is marginally higher in numerical frequency than flint at Powbrone the incidence of flint flakes and blades is greater when compared to the statistical data of chert, which may either signify collection bias, or refer to different selection policies or to a different period of reduction. This pattern is not reflected at Climpy, Daer 84 and Daer 85.

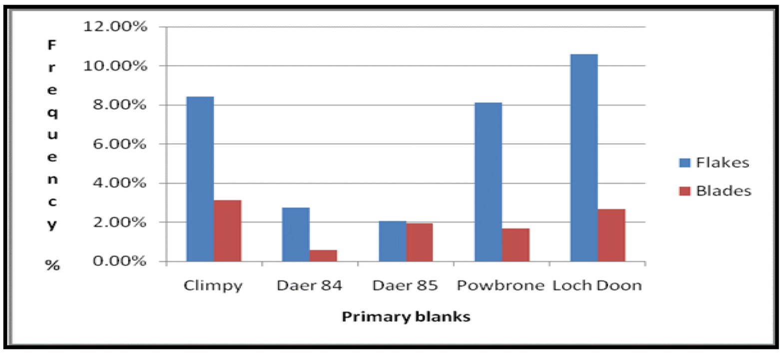

Figure 6.7: Percentage frequencies of primary blanks from Climpy, Daer 84, Daer 85, Powbrone and Loch Doon.

	Climpy	%	Daer 84	%	Daer 85	%	Powbrone	%
Tested Split Pebbles	0	0.00%	3	0.17%	6	0.34%	72	4.89%
Chunks	47	5.99%	78	4.31%	83	4.71%	51	3.47%
Cores	15	1.91%	59	3.26%	58	3.29%	82	5.57%
Flakes	250	31.85%	725	40.03%	773	43.82%	888	60.37%
Primary	21		20		16		72	
Secondary	127		234		234		240	
Tertiary	102		471		523		576	
Primary regular	3		3		0		5	
Primary irregular	18		17		16		67	
Secondary regular	41		24		23		23	
Secondary irregular	86		210		211		217	
Tertiary regular	32		39		54		61	
Tertiary irregular	70		432		469		515	
Blades	64	8.15%	258	14.25%	340	19.27%	239	16.25%
Primary	2		5		2		4	
Secondary	21		50		86		65	
Tertiary	41		203		252		170	
Primary regular	1		1		0		2	
Primary irregular	1		4		2		2	
Secondary regular	12		25		42		24	
Secondary irregular	9		25		44		41	
Tertiary regular	20		100		139		76	
Tertiary irregular	21		103		113		94	
Small Fraction	368	46.88%	577	31.85%	392	22.22%	99	6.73%
Modified	41	5.22%	111	6.13%	112	6.35%	40	2.72%
Total	785	100.00%	1811	100.00%	1764	100.00%	1471	100.00%

Table 6-4: Character of the artefacts from Climpy, Daer 84, Daer 85 and Powbrone. The assemblage from Climpy does not include 20 artefacts recovered outwith the main scatter areas.

6.4 Cores

Chert is the dominant raw material for cores, apart from Daer Reservoir where flint cores are more common (Table 6-5; Figure 6.9). 78.95% of the 57 cores from Starr 1 are chert; flint 21.05% (Finlayson 1989, 166).

The comparison of the percentage frequencies of cores to the raw material components within the assemblages shows close common differences, except for quartz cores which are markedly under-represented at Powbrone (Figures 6.10 and 6.11).

	Climpy: Bipolar	Daer 84: Bipolar	Daer 85: Bipolar	Powbrone: Bipolar	Daer Reservoir: Bipolar	Weston: Bipolar	Climpy: Platform	Daer 84: Platform	Daer 85: Platform	Powbrone: Platform	Daer Reservoir: Platform	Weston: Platform
Chert	4	16	21	43	2	2	11	41	35	8	19	84
Flint		1		6	3			1		4	29	5
Quartz				2						1		
Quartzite				13								
Agate										2		
Chalcedony					1						3	
Jasper										1		
Siltstone			1						1		1	
Mudstone				1								
Indeterminate										1		
	4	17	22	65	6	2	11	42	36	17	52	89

Table 6-5: Numerical frequencies of cores by raw material and reduction strategy.

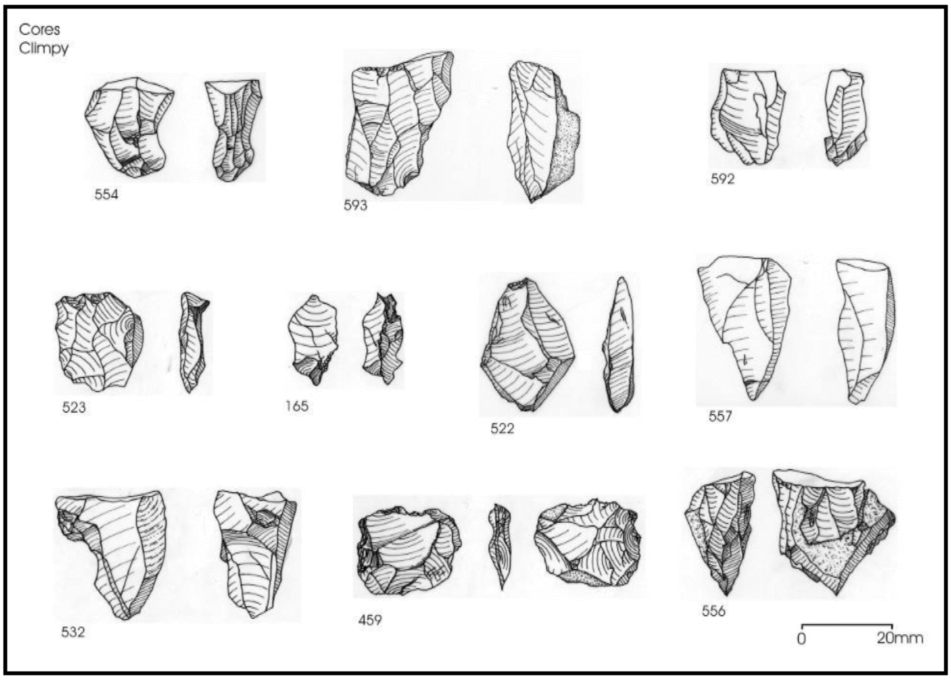

Figure 6.8: Illustration of a selection of platform (554, 592, 522, 557, 532, 556) and bipolar cores (593, 523, 165, 459) from Climpy. © Alice Watterson used with permission.

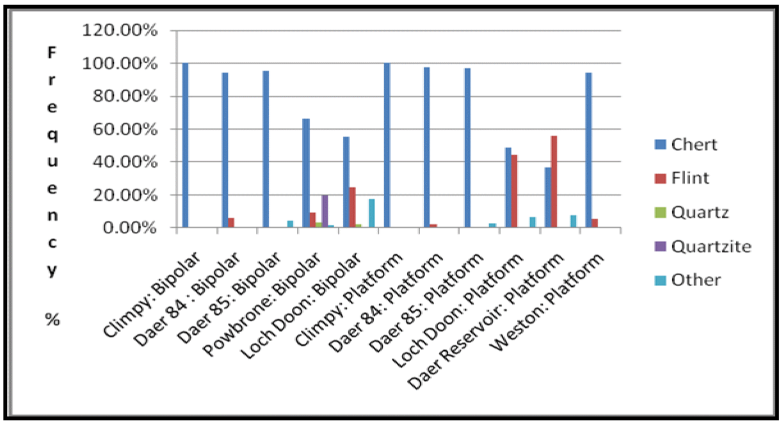

Figure 6.9: Percentage frequencies of cores by raw material and reduction strategy. Data for Daer Reservoir and Weston is from samples.

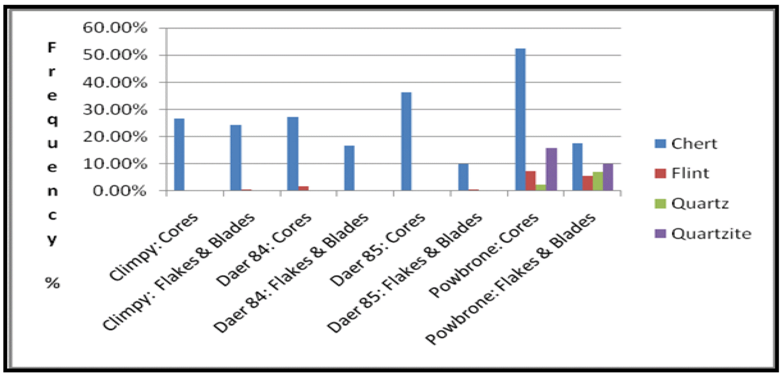

Figure 6.10: Percentage frequencies by raw material of bipolar cores and blades and flakes to the total number of cores and blades and flakes, respectively.

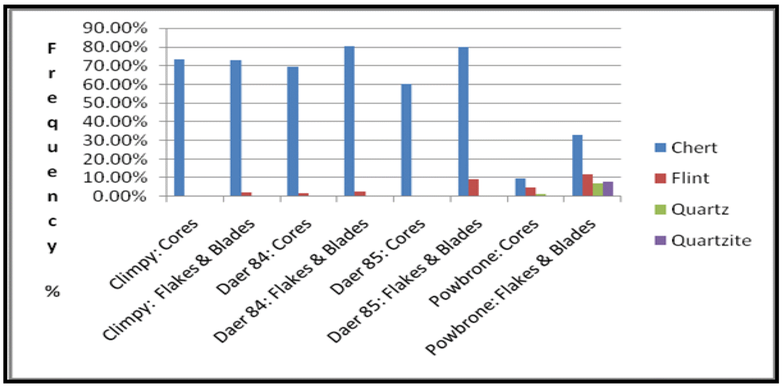

Figure 6.11: Percentage frequencies by raw material of platform cores and blades and flakes to the total number of cores and blades and flakes, respectively.

The comparison of the percentage frequency of flakes and blades to cores by reduction strategy suggests that platform cores at Powbrone are also under-represented in the collection, and to a lesser extent at Daer 84 and Daer 85. This position is exacerbated by the probable under-statement of bipolar debitage products. There are three factors which may explain this apparent paradox in respect of Powbrone. Firstly, the bias in the assemblage may simply be due to the methodology and the locational partiality in the recovery of the artefacts. Secondly, this analysis supports the premise that the assemblage represents a palimpsest of occupations, which coupled with the biases of recovery, determines the lack of integrity to the assemblage. Thirdly, cores are characterised by the negative scars of the last removals prior to discard (Finlay *et al*. 2000, 556) resulting in the understatement of the frequency of platform cores. It is possible that the use of a bipolar reduction strategy was, in part, a device adopted for the reworking of platform cores to extend the functioning life of the core. The average metric dimensions for bipolar cores are slightly greater than those for platform cores. Drawing sustainable conclusions from the metric analysis is hampered by the small number of platform cores for comparanda. Plotting the length of the analysed chert bipolar and platform cores highlights wide variations in the data with platform cores greater in length (Figure 6.12). It is possible that the bipolar reworking of platform cores was complementary strategy to platform reduction.

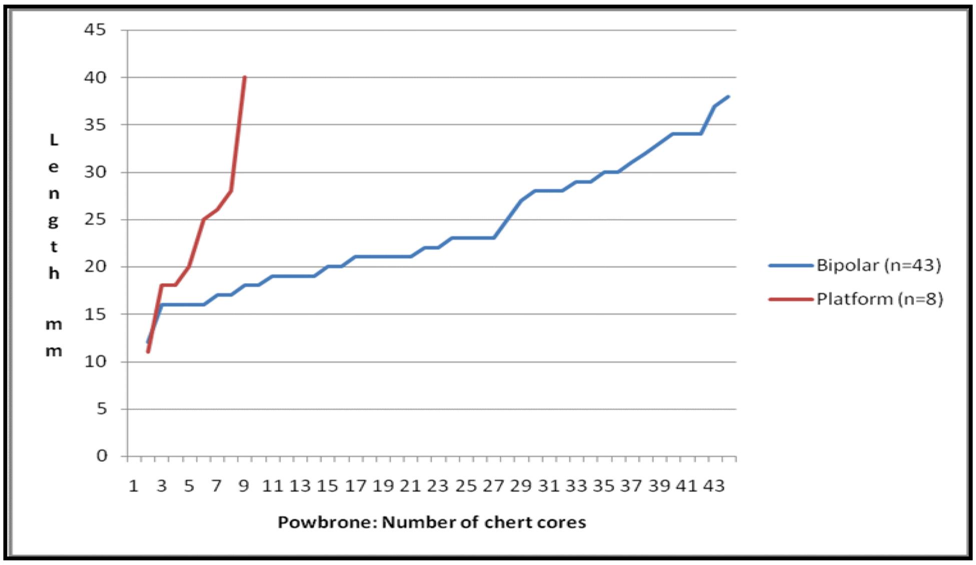

Figure 6.12: Statistical analysis of length of individual chert cores by reduction strategy from Powbrone.

The average dimensions of bipolar cores at Daer 84 and Daer 85 (Appendix I: Table 10-3) are greater than the corresponding data for platform cores (Appendix I: Tables 10-6 to 101-8). One bipolar core from Daer 85 suggests that it was previously used for platform reduction. However, from the length of chert cores from Daer 84 and Daer 85 (Figure 6.13) it can be demonstrated that it is unlikely that the platform cores were strategically reworked as bipolar cores. This may suggest either recovery bias, or that some platform cores were curated.

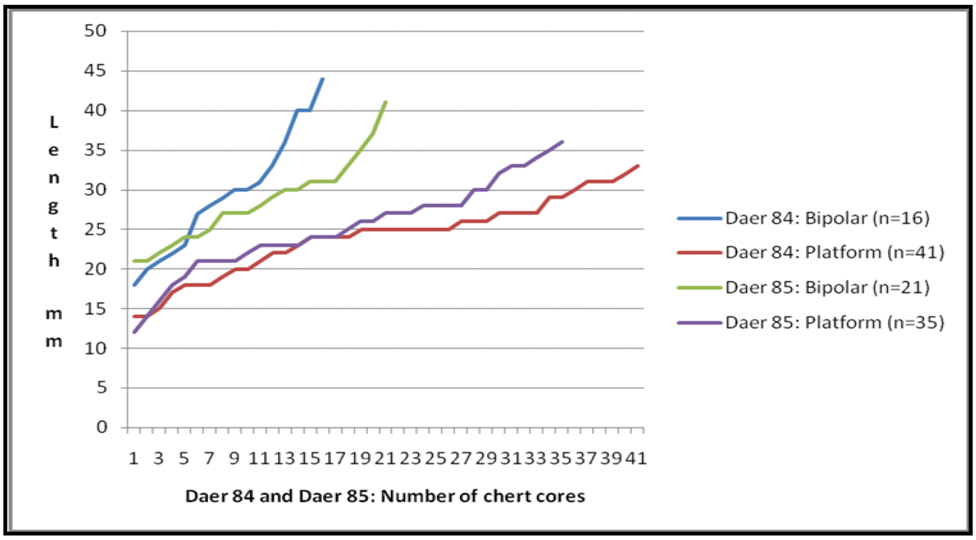

Figure 6.13: Statistical analysis of length of individual chert cores by reduction strategy from Daer 84 and Daer 85.

In contrast, there are common differences in the percentage frequencies of cores and blanks by reduction strategy in the assemblage from Climpy (Figure 6.14). What may account for this? Firstly, the fieldwork at Climpy was undertaken by a commercial unit to modern professional standards. Secondly, the lithics were recovered from a largely undisturbed old ground surface with the majority recovered from *in situ* locations. The recovery rates of small fraction debitage and the results of the technological attribute analysis confirm the integrity of the assemblage (Innes *et al.* forthcoming; Wright 2008; Table 6.4).

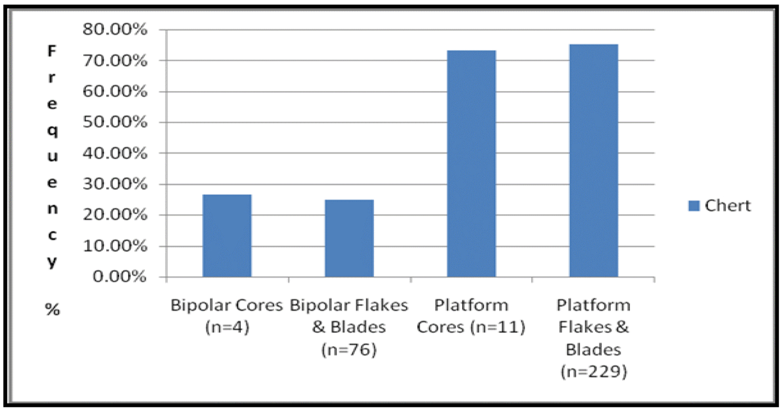

Figure 6.14: Percentage frequencies of chert flakes and blades to chert cores by reduction strategy from Climpy.

The cores from Loch Doon suggest differential strategies for raw materials, where chert and quartzite are preferred for bipolar reduction and chert and flint, in broadly equal percentage frequencies, were chosen for platform reduction (Figure 6.9). This differential selection policy may indicate different periods of activity.

It has been noted from the attributes of a number of flakes and blades from Climpy, Daer 84, Daer 85 and Powbrone that an anvil was used to support the core during the platform reduction strategy, suggesting that bipolar and platform reduction was coeval.

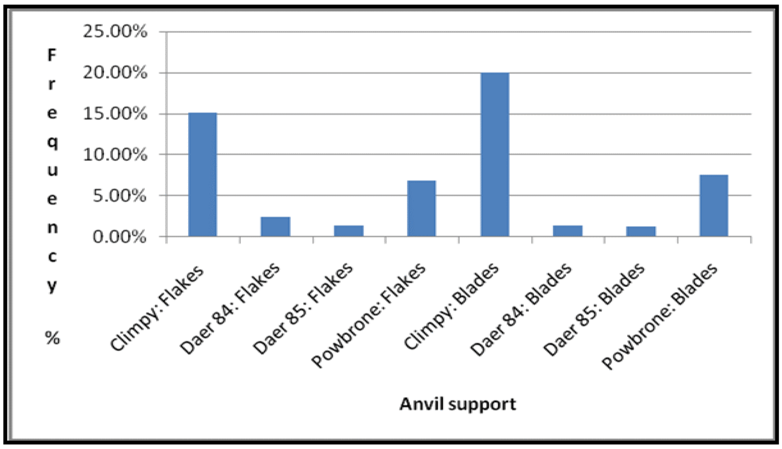

Figure 6.15: Percentage frequencies of anvil support during platform reduction for flakes and blades.

6.4.1 Bipolar core attributes

The analysis of the bipolar core attributes is set out at Appendix I (Tables 10-1 and 10-2). There are a number of common differences as well as marked variations across the inland assemblages from the research transect area which arises out of the technological analysis. There are relatively low populations of bipolar cores from Climpy and Daer Reservoir. The core sampling strategy for Weston and Loch Doon favoured platform cores.

Common differences are found in the preference of a softer hammerstone producing a negative diffuse bulb of percussion, the general utilisation of medium sized pebbles/ angular pieces, and the extensive working of cores which is validated by reference to the number of platforms, platform stage analysis and the average number of scars visible on the cores.

Figure 6.16: Quartzite and quartz bipolar cores from Powbrone.

6.4.1.1 Agularity/sphericity

The patterning of the angularity/sphericity of the original raw material used for bipolar cores is more complicated. Where it can be ascertained, angular and sub-angular variants represent 90.00% of the bipolar cores from Daer 84; Powbrone 63.41%, Daer 85 50.00% and 100.00% for both Climpy and Daer Reservoir. It should be noted that there is only one core from both Climpy and Daer Reservoir where angularity is established. Sub-rounded and rounded attributes are noted in the assemblages from Daer 84 (10.00%), Daer 85 (50.00%), Powbrone (36.59%) and Loch Doon (100.00%). The pebble resources are chert, except for two and three flint pebbles from Loch Doon (100.00%) and Powbrone (20.00%), respectively; indicating a secondary resource.

6.4.1.2 Cortex type

The variations in the original cortical surface of chert highlight different selection policies and/or different periods of activity. The contrast is most pronounced at Powbrone, Daer 84 and Daer 85 with regard to the frequency of artefacts with a smooth/chalky cortex in contrast to a smooth/hard variant.

6.4.1.3 Size dimensions

A comparison of the size dimensions of chert bipolar cores shows markedly common differences in the mean metric data from Daer 84 and Daer 85 (Figure

6.15). The chert bipolar cores from Powbrone are generally smaller than the counterparts from Daer 84 and Daer 85. This does not necessarily indicate that the Powbrone cores were worked more extensively. The average number of negative scars on the Powbrone cores is 6.2, which is fewer than Daer 84 at 6.7 and Daer 85 at 8.5, although the Powbrone cores have a greater number of visible platforms. The cores from Climpy are considerably smaller than those from Daer 84, Daer 85 and Powbrone based on the average dimensions. There are fewer visible platforms which may that core management was more controlled, which may also account for the relatively smaller maximum dimensions across the three metric variants (Appendix I: Table 10-3; Figure 6.17).

The flint bipolar core population is numerically low. A review of the mean statistical data from Daer Reservoir, Powbrone and Loch Doon shows wide variations in length, width and thickness (Table 6-8). The quartzite cores from Powbrone are statistically larger than those cores fashioned in other raw materials across the assemblages. However, the presence of a number of cores with high values for width and thickness distorts the mean data producing STDEV of ±17.43mm and ±9.87, respectively (Appendix I: Table 10-3; Figure 6.18).

6.4.1.4 Probable reasons for abandonment

For those assemblages with more than two bipolar cores, the combination of not being able to maintain a working angle for the removal of blanks and/or stepping and hinging to the flaking surface of the cores are considered to be the principal reasons for the abandonment of cores (Appendix I: Table 10-1). It may be assumed that corrective measures would have reduced the cores to a size too small to produce the desired blanks. Abandonment due to size has the highest percentage occurrence at Climpy 25.00% followed by Powbrone 16.92% and 5.88% for Daer 85, although this data is represented by only one core from both Climpy and Daer Reservoir. The low frequency of flaws being the probable cause of abandonment suggests either the use of good quality raw materials, or skill of the knapper responding to variations in raw materials.

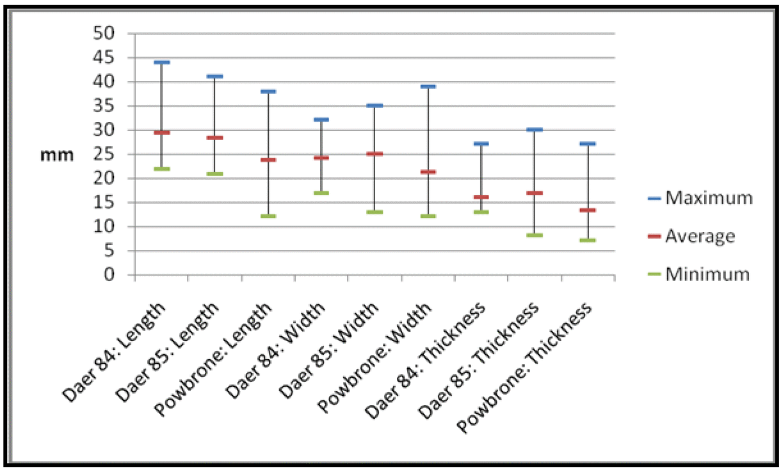

Figure 6.17: Metric data from the analysis of chert bipolar cores from Daer 84, Daer 85 and Powbrone.

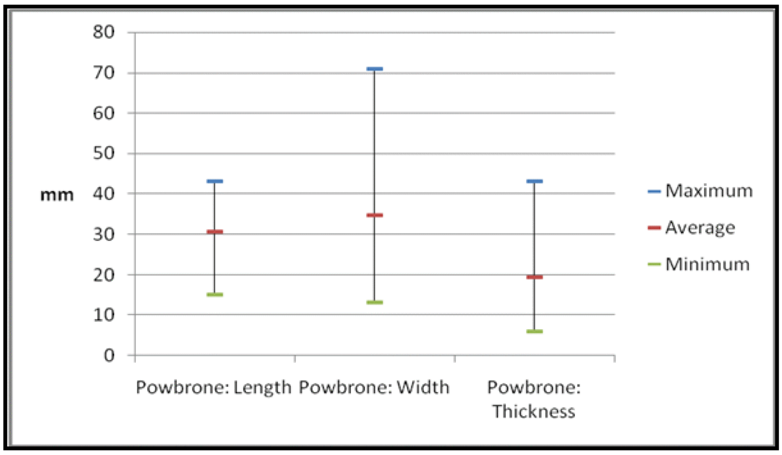

Figure 6.18: Metric data from the analysis of quartzite bipolar cores from Powbrone.

6.4.2 Platform core attributes

The data from the analyses of core attributes and size dimensions are set out at Appendix I (Tables 10-4 to 10-8) and Figures 6.25 to 6.27. Common differences occur in the choice of medium sized pieces of raw material, the preference for a softer hammerstone producing a negative diffuse bulb of percussion and platform utilisation which correlates to the platform stage analysis.

6.4.2.1 Agularity/sphericity

Marked variations are noted in the form of raw materials (Figure 6.19). Common differences are noted at Daer Reservoir and Loch Doon, Daer 84 and Daer 85, and Climpy and Weston. Powbrone is distinguished as the only site where rounded/sub-rounded raw materials dominate.

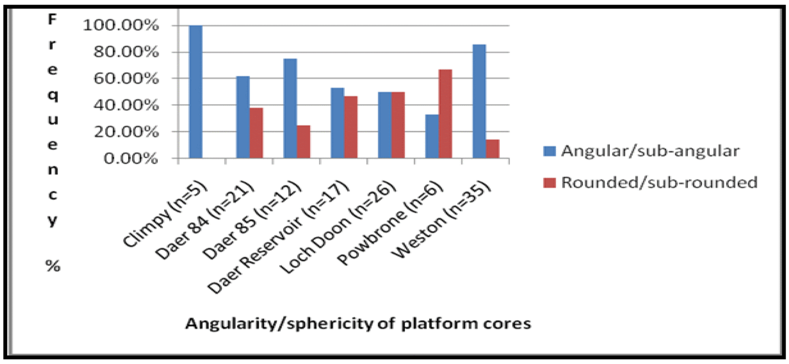

Figure 6.19: Percentage frequencies showing angularity/sphericity of bipolar cores.

6.4.2.2 Cortex type

The percentage frequency of a smooth/cortical surface broadly equate at Daer 84 and Daer 85, which is contradictory to the evidence from bipolar cores (Section 6.4.1.2). There are common differences at Loch Doon and Weston, and Climpy and Powbrone where the smooth/hard cortical variant dominates. The preponderance of cores with a smooth/chalky cortical surface sets Daer Reservoir apart (Figure 6.20).

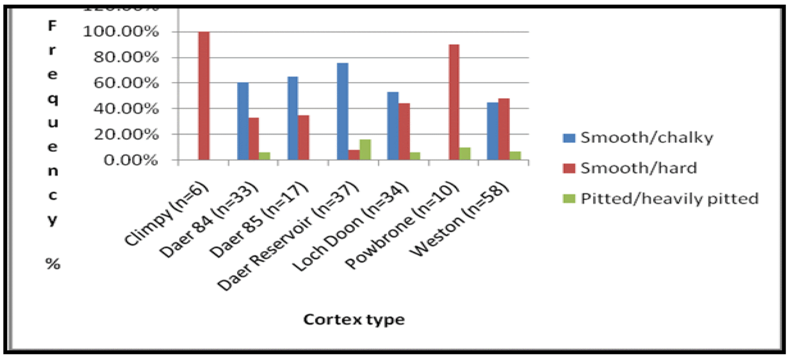

Figure 6.20: Percentage frequencies of cortex type to platform cores.

6.4.2.3 Core platform type

The sampling strategy of the Loch Doon assemblages favoured blade cores and, therefore, cannot be used for comparanda for platform types. The variations show blade platforms ascendant at Climpy and Daer Reservoir, and flake platforms at Daer 84, Daer 85 and Powbrone. Weston is the only site where non-specific platforms are the most common (Figure 6.21).

The relatively high occurrence of non-specific platforms from Daer Reservoir and Weston correspond to a remarkably low frequency of flake platforms. This patterning is particularly interesting. Firstly, this interpretation is based on the attributes immediately prior to discard. It may be argued that the cores from Daer 84, Daer 85 and Powbrone were generally either used for blade production or flake production. In contrast, a substantial proportion of the cores from Daer Reservoir and Weston were potentially inter-changeable with regard to the blanks produced. This may reflect either different episodes of activity, or task differentiation or sharing. The evidence from Climpy, although based on the analysis of only 11 cores, falls within these parameters. Secondly, certain non-specific platform cores from Daer Reservoir and Weston, and flake cores from Daer 84 and Powbrone may have been originally blade platform cores.

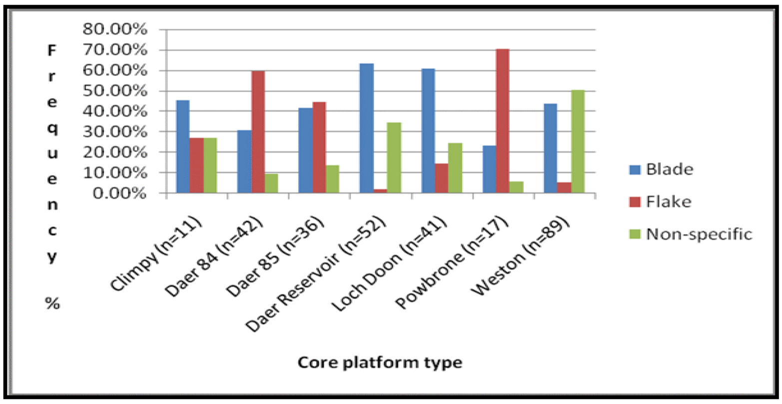

Figure 6.21: Percentage frequencies of core platform types.

6.4.2.4 Number of visible platforms

Single and dual platforms generally prevail across the assemblages, although in varying degrees of percentage frequency. The percentage frequencies of cores with opposed platforms and an earlier transverse platform broadly equate at Climpy, Daer 85 and Daer Reservoir as do Daer 84 and Weston. Cores with transverse and perpendicular opposed platforms are present in all of the assemblages (Figure 6.22).

It is possible that those cores with only one transverse platform may have been dual opposed cores with all attributes associated with the other platform having been lost. The platform stage analysis broadly follows the incidence of visible platforms.

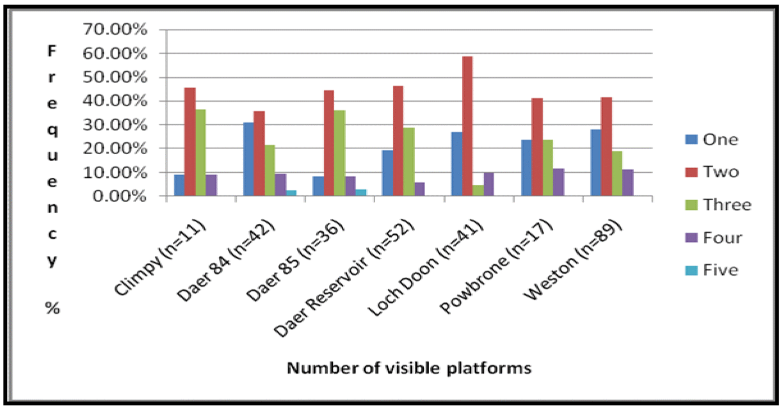

Figure 6.22: Percentage frequencies of number of visible platforms to platform cores.

6.4.2.5 Size dimensions

The dimensions for blade, flake and non-specific platform cores are detailed at Appendix I (Tables 10-6 to 10-8), respectively. The mean metric data across the three measured parameters show that flake and non-specific cores are generally larger, although flake and non-specific platforms are smallest at Powbrone and Weston, respectively. The average length of chert blade cores ranges from 25.82mm at Daer Reservoir to 20.35mm at Weston. Daer Reservoir cores have the greatest mean width (21.27mm) and lowest value for average thickness (12.82mm). The thickest cores are from Daer 84 (average 14.46mm) and Weston has those with least average width (18.18mm).

6.4.2.6 Probable reasons for abandonment

The most frequent occurrences for the probable abandonment of cores are where the flaking angle has not been maintained and/or there is stepping and hinging to the working face of the cores. Flaws in the raw material leading to the abandonment of cores are only noted at Climpy (27.27%), Daer Reservoir (11.54%) and Daer 84 (2.38%), which may infer the choice of good quality raw materials, or the ability of the knapper to counteract variations in the raw material (Figure 6.23). Poor quality is considered to be the major factor at Climpy.

Apart from Climpy, Weston and Daer 84 there does not appear a close correlation to cores abandoned due to size and the percentage area of platform utilised (Figure 6.24). Climpy and Weston have high values for utilisation and abandonment due to size, and an average number of negative scars per core at 9.6 and 9.2, respectively. Conversely, Daer 84 has the lowest incidence of platform utilisation, with only 9.52% of cores abandonment because of size, and an average of 6.1 negative scars per core. This suggests that the problems with the failure to maintain a working angle and stepping and hinging caused problems earlier in the reduction sequence, and implies that core maintenance was poor. Powbrone has the highest incidence size abandonment, although only 52.94% of cores have an utilised platform area of more than 75.00%. The average number of negative scars appears low at 5.1. However, flake cores represent 70.59% of the cores from Powbrone which infers that larger pieces were being removed. Unlike Daer 84 the low factor of scars per core does not necessarily indicate any failure in core maintenance. The average number of scars for the cores from Loch Doon (8.8) and Daer Reservoir (9) has common differences to the data for Weston and Climpy. The percentage frequencies for the abandonment of cores due to size are intermediate to the high occurrences for Powbrone, Weston and Climpy and the low values for Daer 84. This infers that core maintenance strategies, although not as good as the former were appreciably better than the latter. The lowest incidence of size abandonment is seen in the cores from Daer 85 (8.33%). Platform utilisation is 77.76%, with a broad common difference to Weston at 82.02%, with an average of 7.8 for negative scars. Non-blade cores are lower at Daer 85 (58.33%) compared to Daer 84 (69.05%), which suggests that the problems associated with core maintenance highlighted at Daer 84 were present at Daer 85, although potentially much later in the reduction sequence. This analysis is not thought to be influenced by inferior quality raw materials bearing in mind the percentage frequencies for flaw abandonment are greater for Climpy and Daer Reservoir compared to Daer 84.

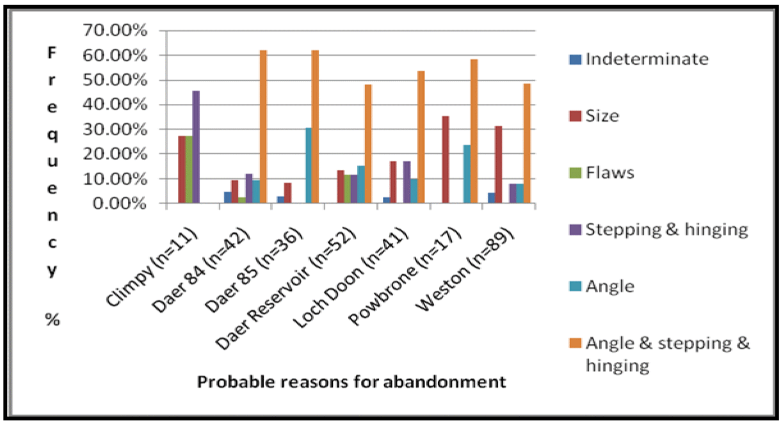

Figure 6.23: Percentage frequencies for the probable abandonment of cores.

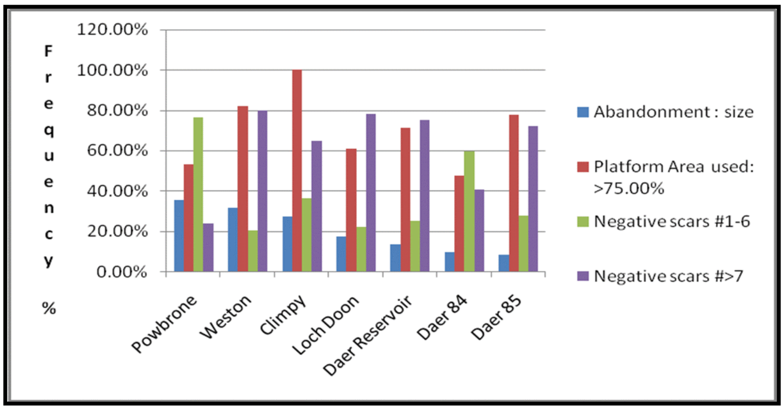

Figure 6.24: Percentage frequencies of platform cores probably abandoned due to size contrasted with percentage area of platform utilised and arbitrary bands of the number of negative scars on the discarded cores.

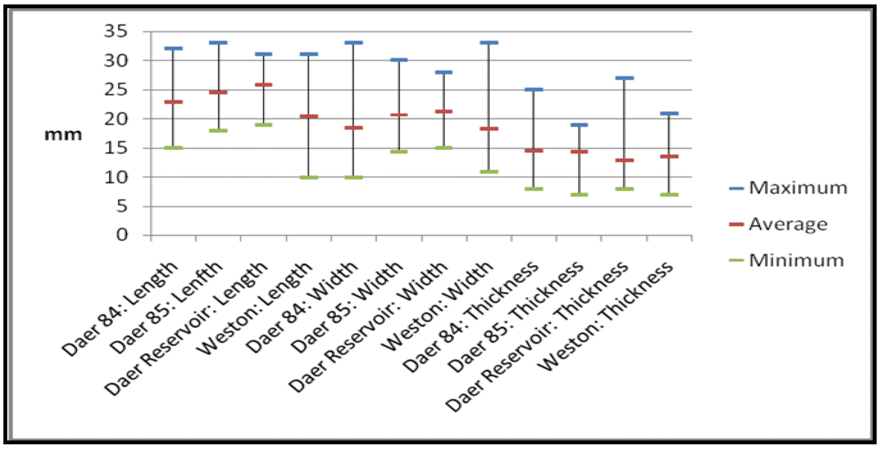

Figure 6.25: Metric data from the analysis of chert blade platform cores from Daer 84, Daer 85, Daer Reservoir and Weston.

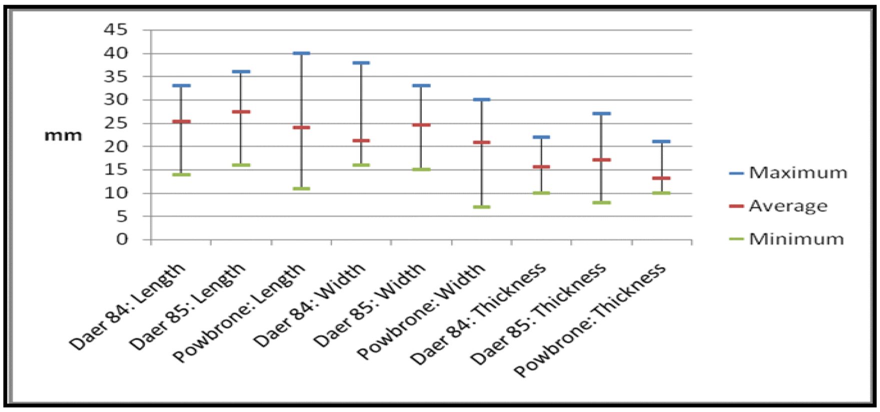

Figure 6.26: Metric data from the analysis of chert flake platform cores from Daer 84, Daer 85 and Powbrone.

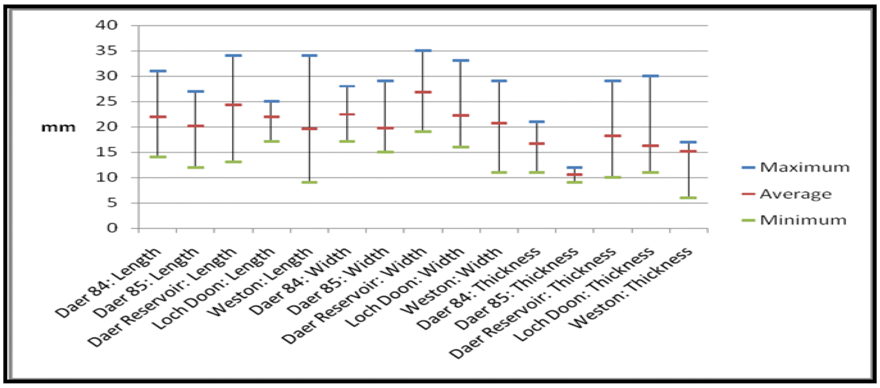

Figure 6.27: Metric data from the analysis of chert non-specific platform cores from Daer 84, Daer 85, Daer Reservoir, Loch Doon and Weston.

6.4.3 Core rejuvenation and core maintenance

The scrub preparation prior to the removal of a blank with step and hinge terminations to the dorsal surface may indicate core rejuvenation strategies to facilitate future removals (Figure 6.28). Plunging terminations with those attributes suggest an overshot core rejuvenation strategy not only to remove the negative scars of step and hinge terminations but also to remove an accumulation of material at the distal end of the core (Figure 6.29). Other blanks with plunging terminations are considered to be as a result of knapping error.

A further strategy is recorded for core rejuvenation practices across the assemblages, comprising of a transverse blow from the left to remove part of the platform surface. The average loss of platform surface was 7mm at Powbrone; Daer 85 6mm, Daer 84 5mm and Climpy 4mm.

There are a number of cores from the Climpy, Daer 84, Daer 85 and Powbrone assemblages with a dominant platform and a sub-ordinated opposed platform. The dominant platform has common differences to those examples which would be categorised as single platform cores. In each of the cases referred to there are non-sequential removals from a sub-ordinate opposed platform to maintain the working shape of the core.

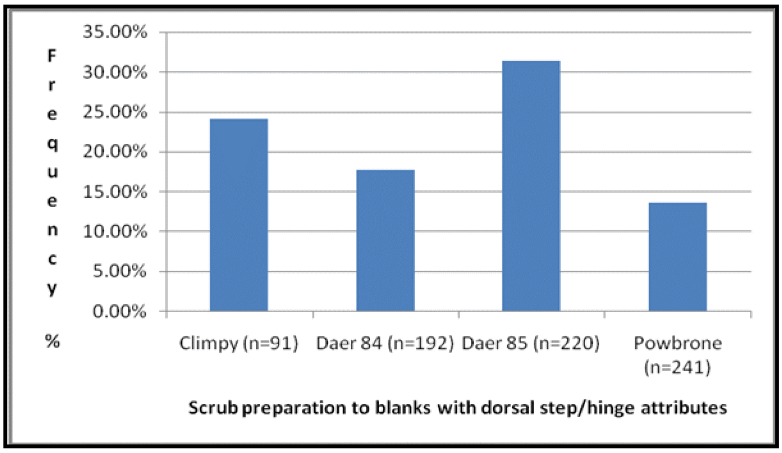

Figure 6.28: Percentage frequencies of blanks with scrub preparation and dorsal step/hinge attributes.

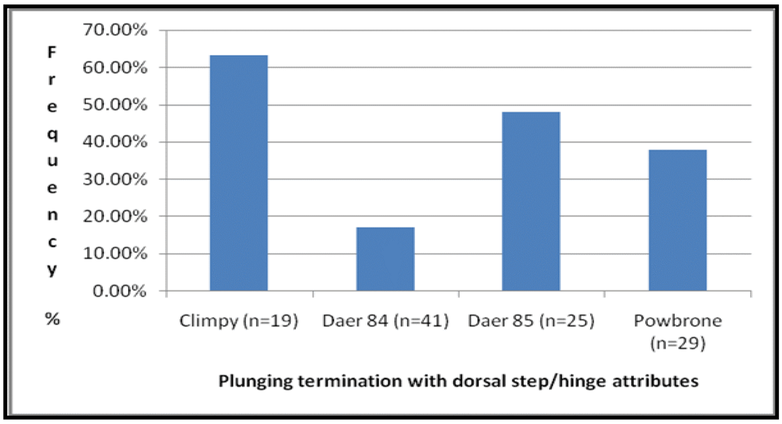

Figure 6.29: Percentage frequencies of blanks with plunging distal terminations and step/hinge attributes to the dorsal surface.

6.5 Technological analysis of the debitage

6.5.1 Tested split pebbles

Tested split pebbles do not feature in the assemblages apart from Powbrone where a wide variety of raw materials were tested for potential utilisation. The most common materials are quartz 34.72% and flint 26.39%, followed in order of percentage frequency by chert 12.50%, quartzite 11.11%, agate 9.72% and an abraded indeterminate raw material 5.56%. There are 58 primary (80.56%) and 14 secondary (19.44%) pieces. The percentage frequency of a smooth/hard cortical surface is 80.56%; pitted/battered 19.44%. The latter attribute is recorded on flint, chert, quartz, quartzite and agate pebbles, which may indicate different raw material selection from different resource locations.

6.5.2 Chunks

The occurrence of chunks is relatively low bearing in mind the propensity for chert to fracture (Table 6-4), and the over-representation because of the low recovery of small fraction debitage. This may generally reflect a bias in recovery and/or recognition, although the chunks in the chert assemblage from Glentaggart in Lanarkshire represented only 6.05% of the assemblage (Ballin and Johnson 2005).

4.31% of the assemblage from Daer 84 is represented by chunks; Daer 85 4.71%. There are common differences for the incidence of bipolar reduction 85.90% for Daer 84 at 85.90%; Daer 85 85.54%. 50 (64.10%) of the chunks from Daer 84 have cortex present. All of the pieces, apart from one example, are secondary; a pattern replicated at Daer 85. Smooth/hard cortex dominates at 56.00% with smooth/chalky surface present on 26.00% on chunks with cortex present. The remainder present with a pitted/heavily cortex (18.00%). In contrast, cortex is visible on 45.78% from Daer 85 with a smooth/chalky cortical surface on 86.84% of the pieces; smooth/hard 10.53% and pitted 2.63%. This provides further evidence for different selection strategies at Daer 84 and Daer 85.

Pièces esquilées are a product of a bipolar reduction strategy and have been recognised for the purpose of this study as a product of primary technology and not as a tool form. Three chert *pièces esquilées* have been recognised at Daer 84. Two are grey and one is greenish grey in colour. One example presents with a smooth/chalky cortex. There are 16 chert *pièces esquilées* from Daer 85. Greenish greys dominate at 56.25% with greys at 31.25%, and one each in brown and black. Six of the *pièces esquilées* (37.50%) have a visible smooth/chalky cortex. The remaining 12 examples are tertiary. One of the burnt chert chunks from Powbrone is a *pièce esquilée*.

6.5.3 Flakes

60.37% of the assemblage from Powbrone is flakes; Daer 85 43.82%, Daer 84 40.03% and Climpy 31.85%. The principal raw material components within the assemblages from Climpy, Daer 84 and Daer 85 are chert and flint, and from Powbrone chert, flint, quartz and quartzite (Table 6-6). The other raw materials present in the flake component of the assemblages from Climpy, Daer 84, Daer 85 and Powbrone are shown at Table 6-5.

	Climpy	Daer 84	Daer 85	Powbrone
Agate			1	
Chalcedony			1	
Mudstone				1
Pitchstone				2
Quartz	1	1	3	
Indeterminate				2
Total	1	1	5	5

Table 6-6: Flakes of other raw materials within the assemblages from Daer 84, Daer 85 and Powbrone.

The low occurrence of primary flakes (Table 6-8) may suggest that the primary knapping of pebble resources was not undertaken at Climpy, Daer 84, Daer 85 and Powbrone. The exception is at Powbrone where 24.74% of bipolar quartzite flakes are primary, which suggests that these flakes may have been recovered from a location where quartzite was opened using a bipolar reduction technique. The overall presence of primary flakes Loch Doon has common differences to Powbrone. However, the occurrence of primary flint flakes is high at 30.27%, which must be considered in conjunction with the fact that flint accounts for 77.78% of tested split pebbles. A proportion of the primary flint flakes may have derived from the tested split pebbles, although it was not possible to refit any of the blanks to the pebbles. While it is possible that flint pebbles were taken to Loch Doon having been harvested elsewhere, it seems more likely that riverine or gravel flint was recovered in the vicinity of Loch Doon, although 10.26% of artefacts present with a pitted/battered cortical surface which may suggest the use of beach pebble flint brought in the coast (cf. Section 4.7.2). Flint flakes account for 48.09% of all of the flakes from Loch Doon; chert 43.81%, chalcedony 6.77% and others 1.33%. The utilisation of raw materials other than flint and chert seem to be more prevalent where there are higher frequencies for bipolar working and tested split pebbles, e.g. quartz and quartzite at Powbrone and chalcedony from Loch Doon.

37.60% of the flakes comprising of the principal raw materials from Powbrone are bipolar; Climpy 27.20%, Daer 84 19.48% and Daer 85 11.98% (Figure 6.30). Incorporating the figures for chalcedony, the percentage frequency for bipolar flakes from Loch Doon is 50.47%.

	Climpy: Bipolar	%	Daer 84: Bipolar	%	Daer 85: Bipolar	%	Powbrone: Bipolar	%	Loch Doon: Bipolar	%
Flakes										
Chert	66	26.94%	138	19.57%	93	13.10%	161	36.59%	300	53.29%
Flint	2	40.00%	3	15.79%	3	5.17%	51	34.00%	290	46.93%
Quartz							58	49.15%		
Quartzite							97	57.74%		
Chalcedony									50	57.47%
Total:	68		141		96		367		640	

	Climpy: Platform	%	Daer 84: Platform	%	Daer 85: Platform	%	Powbrone: Platform	%	Loch Doon: Platform	%
Flakes										
Chert	179	73.06%	567	80.43%	617	86.90%	279	63.41%	263	46.81%
Flint	3	60.00%	16	84.21%	55	94.83%	99	66.00%	328	53.07%
Quartz							60	50.85%		
Quartzite							71	42.26%		
Chalcedony									37	42.53%
Total:	182		583		672		509		628	

Table 6-7: Numerical and percentage frequencies of bipolar and platform flakes for the principal raw materials within the assemblages from Climpy, Daer 84, Daer 85, Powbrone and Loch Doon.

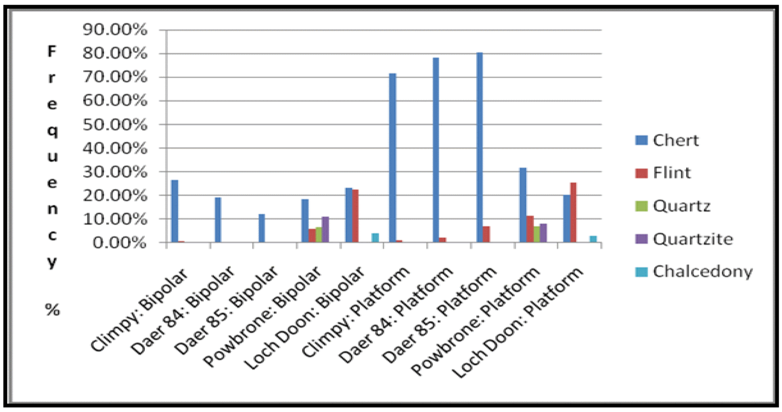

Figure 6.30: Percentage frequencies of bipolar and platform flakes by raw materials from Climpy, Daer 84, Daer 85, Powbrone and Loch Doon.

Figure 6.31: Chert debitage from Daer 85.

	Chert	Bipolar	Platform	Flint	Bipolar	Platform
Daer 84						
Flakes	705	138	567	19	3	16
Primary	19	7	12	1		1
Secondary	224	70	154	10	2	8
Tertiary	462	61	401	8	1	7
Primary regular	3	1	2			
Primary irregular	16	6	10	1		1
Secondary regular	22	4	18	2	1	1
Secondary irregular	202	66	136	8	1	7
Tertiary regular	38	4	34	1		1
Tertiary irregular	424	57	367	7	1	6
Daer 85						
Flakes	710	93	617	58	3	55
Primary	13	4	9	3	1	2
Secondary	203	34	169	29	1	28
Tertiary	494	55	439	26	1	25
Primary regular						
Primary irregular	13	4	9	3	1	2
Secondary regular	20		20	3		3
Secondary irregular	183	34	149	26	1	25
Tertiary regular	48	3	45	6		6
Tertiary irregular	446	52	394	20	1	19
Climpy						
Flakes	245	66	179	5	2	3
Primary	21	9	12			
Secondary	125	40	85	2		2
Tertiary	99	17	82	3	2	1
Primary regular	3	2	1			
Primary irregular	16	7	11			
Secondary regular	40	14	26	1		1
Secondary irregular	85	26	59	1		1
Tertiary regular	29	7	22	1		1
Tertiary irregular	70	10	60	2	2	

	Chert	Bipolar	Platform	Flint	Bipolar	Platform	Quartz	Bipolar	Platform	Quartzite	Bipolar	Platform
Powbrone												
Flakes	440	161	279	150	51	99	118	58	60	168	97	71
Primary	11	5	6	14	10	4	17	9	8	29	24	5
Secondary	106	49	57	51	20	31	30	13	17	49	26	23
Tertiary	323	107	216	85	21	64	71	36	35	90	47	43
Primary regular	1		1	2	2		2	1	1			
Primary irregular	10	5	5	12	8	4	15	8	7	29	24	5
Secondary regular	5	2	3	7	2	5	1	1		9	4	5
Secondary irregular	101	47	54	44	18	26	29	12	17	40	22	18
Tertiary regular	34	10	24	14	5	9	3	1	2	9	6	3
Tertiary irregular	289	97	192	71	16	55	68	35	33	81	41	40

Table 6-8: Character of flakes from Climpy, Daer 84, Daer 85 and Powbrone by reduction strategy.

6.5.4 Bipolar flakes

The attribute analysis of bipolar flakes from Daer 84, Daer 85, Powbrone and Climpy may be found at Appendix I (Tables 10-9 to 10-13). Simple platforms were preferred for the production of bipolar flakes. Cortical platforms are present in each of the assemblages, although the incidences are greater at Powbrone for flint, quartz and quartzite (Figure 6.32). The lesser occurrences of cortical platforms for chert have common differences at Daer 84, Daer 85 and Powbrone. The relatively low frequency at Climpy may be as a result of cores being prepared elsewhere before being brought to the location. Minor populations of facetted platforms are noted at Daer 84 and Powbrone, which is a form of platform preparation generally associated with post-Mesolithic events in prehistory (cf. Ballin 2011). The facets are considered to be accidental and not representing any deliberate patterning for the utilisation of facetted platforms.

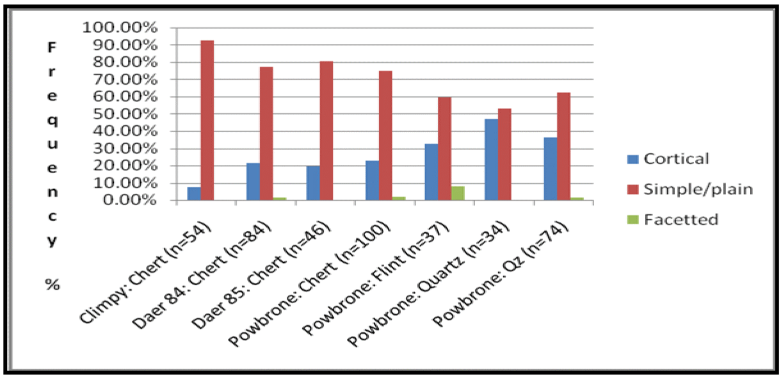

Figure 6.32: Percentage frequencies of platform types for bipolar flakes where the form of the platform could be ascertained.

Diffuse bulbs of percussion dominate the assemblages indicating the preference for a softer hammerstone, which is also indicated by lip attributes on flakes from Daer 84, Daer 85 and Powbrone. The use of a hard hammer producing a pronounced bulb of percussion is more common at Powbrone; chert 43.09%, flint 41.15% and quartzite 35.00%, although 38.04% of the chert flakes from Daer 84 have that attribute; Daer 85 18.18% and Climpy 4.35% (Appendix I: Tables 11-9; 11-11; 11-13). Negative scars from pronounced bulbs of percussion have been recorded on bipolar cores from Powbrone, Daer 84 and Daer 85 (Appendix I: Table 10-1).

Complete chert flakes range from 37.88% for Climpy to 22.58% for Daer 85 (Figure 6.33). The proximal profile of chert flakes show that the combination of the absence of the proximal end, proximal spalling and *siret* fractures are noted on 59.02% of the flakes from Daer 85; Climpy 56.06%, Daer 84 50.00% and Powbrone 45.97%. The low percentage utilisation of a hard hammer may account for the relatively high frequency of complete flakes at Climpy and the lowest occurrence of a missing proximal end (18.18%). The patterning at Daer 84, Daer 85 and Powbrone is more complicated. Daer 85 has statistically the fewest complete flakes and the highest for an absent proximal end (29.02%), although the use of a hard hammer is evidenced on only 18.18% of chert flakes. Hard hammer utilisation at Daer 84 and Powbrone of 38.04% and 43.09%, respectively has markedly reduced the incidences of complete flakes (Daer 84 29.72%; Powbrone 32.92%) compared to Climpy but not to the levels seen at Daer 85. Apart from Climpy, there is no discernible difference in the general quality of the chert across the sites and, therefore, it is suggested that the proximal profile of the flakes may be an indicator to either the skilful application of the bipolar technique, or blank segments were hafted as part of a retooling strategy. In contrast, the proximal profile of the bipolar flint flakes from Powbrone does appear to have been affected by the use of hard hammer. The flint is a better quality raw material than the chert recovered from Climpy, Daer 84, Daer 85 and Powbrone. The percentage of complete flint flakes are at 27.46% is only better than Daer 85. The missing proximal end, proximal spalling and *siret* fractures at 51.82% are comparable to the chert flakes from Daer 84; 54.55% of the flint flakes have evidence for the use of a hard hammer. It is possible that the bipolar reduction of flint refers to either different episode(s) of knapping, or is indicative of an under-representation of a more widespread strategy, or possibly post-Mesolithic activity.

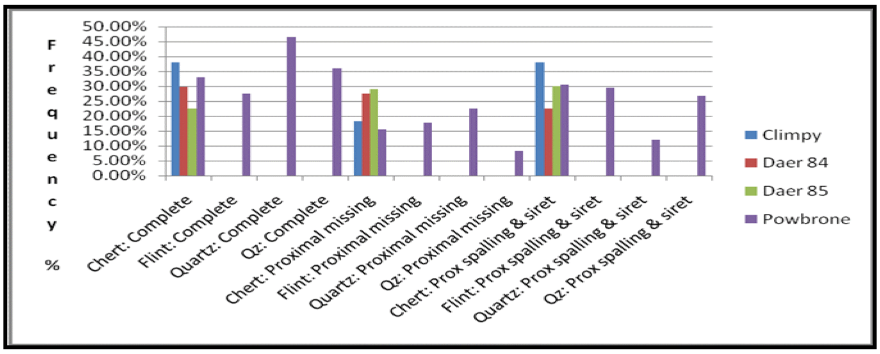

Figure 6.33: Percentage frequencies showing the proximal profile of bipolar flakes by raw material from Climpy, Daer 84, Daer 85 and Powbrone.

6.5.4.1 Dorsal scarring patterns

The common differences of dorsal scarring patterning for Daer 84 and Daer 85 favour longitudinal and multi-directional core orientation, although opposed scarring has a higher frequency at Daer 85. The data from Climpy shows that the incidences of longitudinal, opposed and multi-directional orientations are roughly equal. The chert from Powbrone shows a more intensive orientation pattern with a relatively high frequency of multi-directional scarring. The longitudinal scarring of flint flakes is low when comparison is made across the raw materials from the four sites. The intensive working of flint is suggested by the frequencies of opposed, crossed and multi-directional scarring. Longitudinal and opposed scarring dominate the quartz and quartzite from Powbrone, although there is a higher occurrence of multi-directional scarring for quartz which implies that it was more intensively worked than quartzite (Figure 6.34).

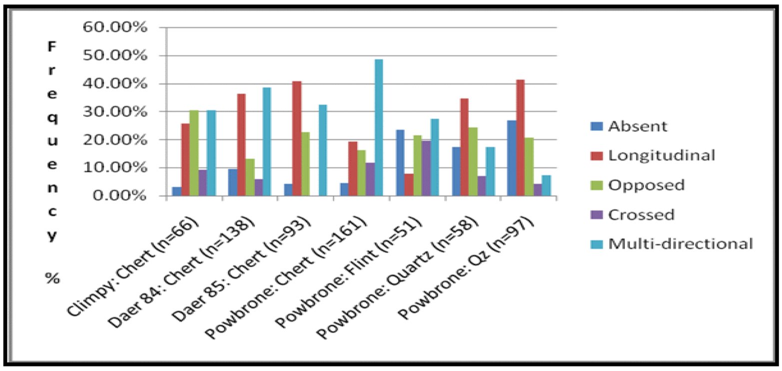

Figure 6.34: Percentage frequencies of dorsal scarring patterns for bipolar flakes by raw material.

It may be argued that the evidence from the dorsal surface of chert bipolar flakes shed further light on the interpretation of the core management strategies referred to above [Section 6.4] (Figure 6.35). The common differences of the dorsal surface attributes for Daer 84 and Daer 85 match the metric data of mean core dimensions (Appendix I: Table 10-3). The higher incidence of step terminations from Climpy may indicate the intensity of working the chert cores to a small size. However, where the size of the cores could indicate an efficient reduction strategy, the evidence of scarring implies that errors in the reduction sequence producing step terminations to the working surface of the cores required a greater frequency of corrective measures resulting in the mean size of the cores from Climpy being relatively smaller to the chert cores elsewhere (cf. Section 6.4.3).

Common differences are noted in the dorsal surface patterning of chert flakes from Powbrone to Daer 84 and Daer 85, although the flint flakes have a higher occurrence of step and hinge terminations. The average metric dimensions of chert and quartz flakes fall within consistent parameters across the metric variants (Table 6-9). The mean data for flint is distorted by the presence of a number of long flakes producing a high STDEV of ±10.92mm. The dimensions of the flake blanks do not show a correlation to dorsal surface attributes. For example, the average sizes of quartz flakes are not dissimilar to their chert counterparts but have low occurrences for step and hinge terminations to the dorsal surface. Quartzite also has low populations of these attributes despite the average metric data showing that flakes are generally longer and wider than those in other raw materials. While skill must be a factor in attempting to tease out an understanding for the variations in the frequencies for the failure to detach blanks with a clean ventral surface; the suitability of certain raw materials for bipolar reduction may also be a factor, e.g. quartz and quartzite.

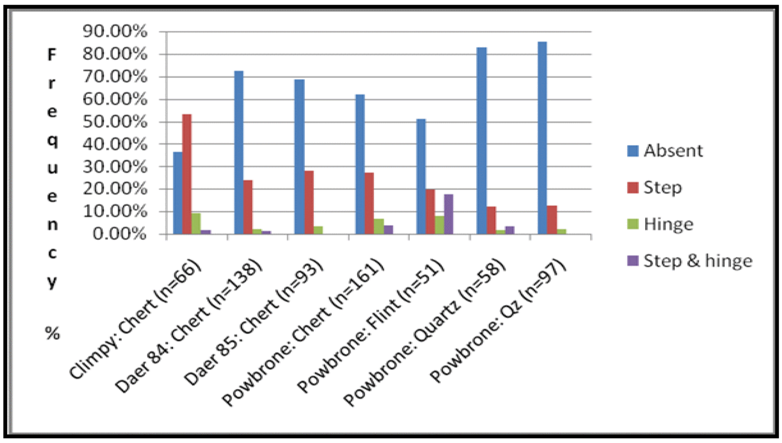

Figure 6.35: Percentage frequencies of dorsal surface attributes for bipolar flakes by raw material.

	Daer 84			**Daer 85**		
Chert	n=78			n=54		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**
Maximum	48	34	16	51	41	18
Minimum	4	4	1	8	6	2
Average	21.08	15.91	6.47	22.33	17.72	7.06
STDEV	7.84	6.12	3.2	8.12	8	3.87
Mode	23	15	5	27	15	4
	Powbrone			**Climpy**		
Chert	**n=105**			n=54		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**
Maximum	45	37	13	46	26	15
Minimum	6	7	2	8	4	2
Average	20.08	15.5	5.4	18.69	12.8	5.13
STDEV	7.06	5.4	2.52	7.14	5.2	2.71
Mode	19	12	3	19	8	4
	Powbrone			**Powbrone**		
	Flint n=32			Quartzite n=75		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**
Maximum	62	34	13	83	72	22
Minimum	9	9	2	11	9	2
Average	25.97	18.91	6.69	30.77	26.81	8.25
STDEV	10.92	6.45	3.08	12.73	12.11	4.39
Mode	38	30	10	28	21	4
	Powbrone					
	Quartz (n=37)					
	L mm	**W mm**	**Th mm**			
Maximum	36	35	15			
Minimum	9	3	2			
Average	20.46	18	6.32			
STDEV	6.55	7.05	3.42			
Mode	20	17	5			

Table 6-9: Size dimensions of bipolar flakes.

6.5.5 Platform flakes

The attribute analyses of platform flakes may be found at Appendix I (Tables 10-14 to 11-18), inclusive. Simple platforms dominate the platform flake components of the assemblages (Appendix I: Tables 10-15; 10-17; 10-18; Figure 6.36). The profile for the incidence of cortical platforms has common differences to bipolar flakes, although at lower levels of percentage frequency (cf. Figure 6.32). Facetted platforms are rare with only one example each from the flake populations of Daer 84, Daer 85 and Powbrone, and probably relate to knapping errors as opposed to a platform strategy for reduction.

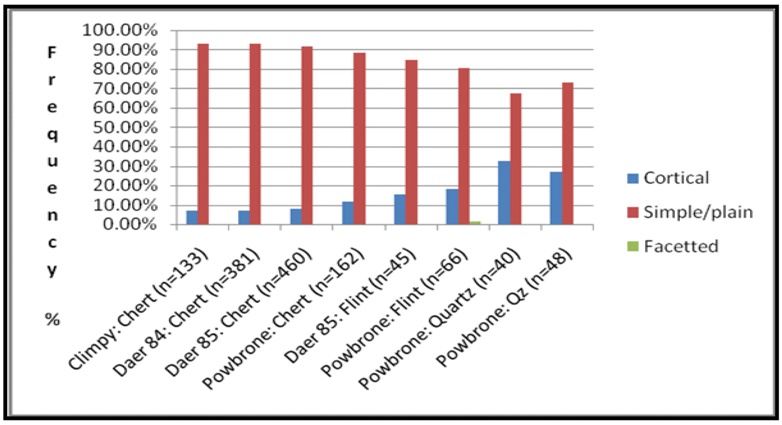

Figure 6.36: Percentage frequencies of platform types for platform flakes where the form of platform could be ascertained.

A softer hammerstone producing diffuse bulbs of percussion was almost exclusively preferred for the removal of flakes from Climpy, Daer 84 and Daer 85. The occurrence of pronounced bulbs is greater at Powbrone, although statistically less frequent than for bipolar flakes, indicating a wider use of soft and hard hammers. The frequency of lip attributes, associated with the use of a soft hammer, is more widespread for platform flakes especially at Daer 84 and Daer 85 (Appendix I: Table 10-14).

The scrub preparation of the platform edge prior to the removal of flakes appears to be an integral part of the reduction sequence for chert flakes from Climpy, Daer 84 and Daer 85 and to a lesser extent at Powbrone (Figure 6.37). The highest percentage frequency for platform preparation is recorded on flint flakes from Daer 85. This pattern at Daer 85 is replicated at Powbrone where platform preparation has a statistically wider application for flint when compared to chert, which suggests greater care in the working of this resource. Platform preparation for quartz and quartzite is low.

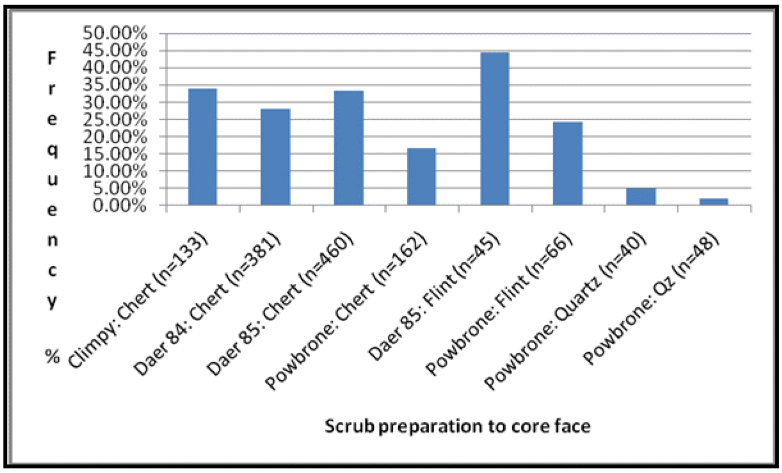

Figure 6.37: Percentage frequencies for the scrub preparation of core face prior to removal of platform flakes.

6.5.5.1 Proximal profile

The site specific patterns associated with proximal profile of chert flakes from Climpy, Daer 84 and Daer 85 have marked common differences (Figure 6.38), which appears to directly correlate to the percentage frequencies of scrub preparation to the core face (Figure 6.37). The incidences of complete flakes, where comparative data exists, from Climpy, Daer 84 and Daer 85 are greater when considered against their bipolar counterparts. Complete flint flakes from Daer 85 are almost double in percentage terms compared to Powbrone, which has common differences to the pattern for platform preparation.

The incidences where the proximal end is missing broadly equate for chert and flint artefacts. It is possible that this represents a conceptual strategy utilising segments for retooling/hafting. A pattern replicated for platform blades (Section 6.5.8.1).

The percentage frequencies of complete quartz and quartzite flakes from Powbrone are reversed when compared to bipolar flakes, despite the increased incidence of platform preparation for quartz (Figures 6.33 and 6.38). This would support the interpretation that these coarser grained raw materials are more suited to bipolar reduction strategies.

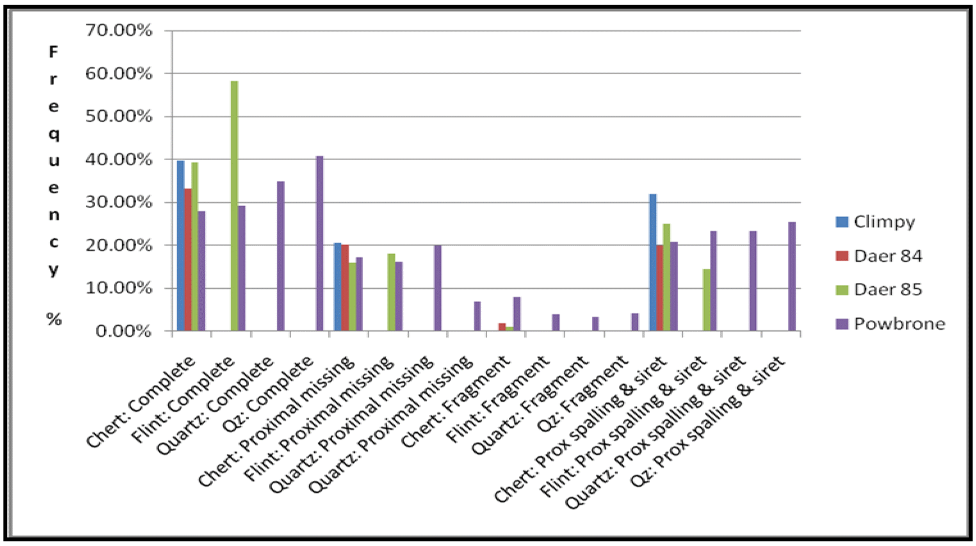

Figure 6.38: Percentage frequencies of proximal profile to platform flakes by raw material.

6.5.5.2 Dorsal scarring patterns

The dorsal scarring patterning for platform flakes show a marked increase in longitudinal attributes when considered against bipolar flakes. The profiles for chert flakes from Daer 84 and Daer 85 have a strong correlation; Powbrone has a marginally higher occurrence of crossed and multi-directional attributes. Climpy is apart with an increased incidence of core orientation with a significant representation of opposed, crossed and to a lesser degree multi-directional scarring (Figure 6.39). This may provide further evidence to support extensive working of cores resulting in the mean size dimensions being notably smaller than those from the other sites.

The profiles of the dorsal scarring patterns for flint and chert from Powbrone have corresponding common differences. The highest incidence of longitudinal attributes is recorded for flint flakes from Daer 85, which infers a high quality of core maintenance, which is replicated to a slightly lesser degree for chert flakes from Daer 84 and Daer 85.

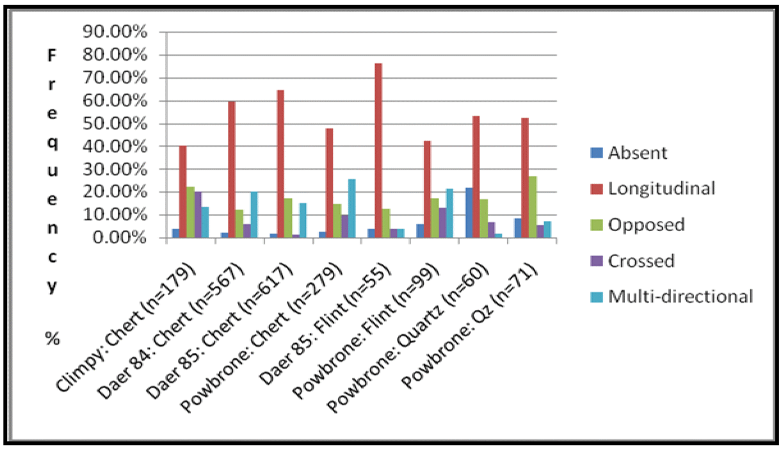

Figure 6.39: Percentage frequencies of dorsal scarring patterns of platform flakes by raw material.

6.5.5.3 Dorsal surface

The analysis of the dorsal surface attributes suggests the homogeneity of technological practice to remove platform flakes with a clean ventral surface (Figure 6.40). The highest incidence of errors is noted at Climpy, which again lends weight to the points made in the bipolar flakes section concerning the need for statistically increased corrective strategies during the reduction process.

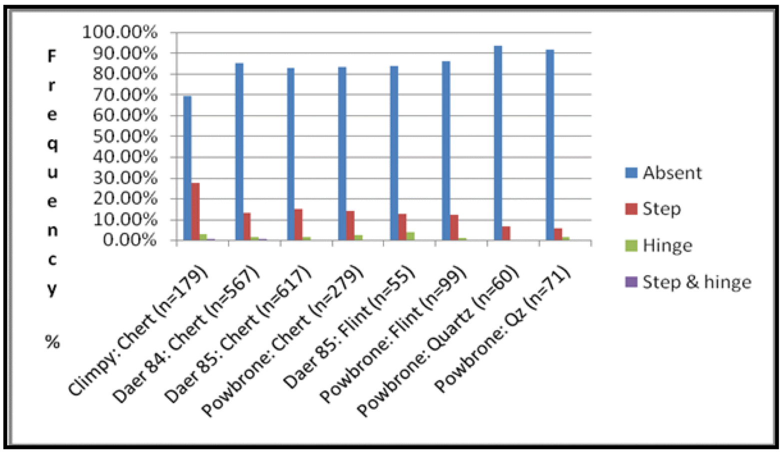

Figure 6.40: Percentage frequencies of dorsal surface attributes for platform flakes.

6.5.5.4 Size dimensions

The average size dimensions from the metric analysis of chert flakes from across the four sites show a broadly uniform profile for platform flake production, with maximum variants of 0.56mm for length; width 1.56mm and thickness 0.55mm.

This patterning is also evident from the data for the mean length, width and thickness of flint flakes from Daer 85 and Powbrone differ by 1.27mm, 0.63mm and 0.03mm, respectively (Table 6-10).

Quartz flakes have common differences in length, although are generally wider and thicker than chert and flint flakes. The average dimensions of quartzite flakes demonstrate a choice to produce larger pieces, which may also suggest the probable difficulties of working with that raw material to produce smaller blanks.

	Daer 84			Daer 85		
Chert	n=304			n=404		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**
Maximum	42	33	16	41	33	16
Minimum	4	4	1	4	5	1
Average	14.38	11.53	3.75	14.24	11.99	3.47
STDEV	5.76	4.1	2.4	6.05	4.78	2.39
Mode	10	10	2	11	11	2
	Powbrone			**Climpy**		
Chert	n=136			n=132		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**
Maximum	27	29	14	38	22	11
Minimum	4	3	1	4	4	1
Average	13.82	12.35	3.46	13.7	10.79	3.2
STDEV	4.68	4.81	2.42	5.32	3.42	1.63
Mode	10	10	2	12	10	2
	Daer 84			**Daer 85**		
Flint	n=12			n=40		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**
Maximum	22	17	7	33	24	8
Minimum	9	6	1	8	6	1
Average	14.58	11.75	3.08	15.85	12.38	3.05
STDEV	4.93	3.38	1.62	5.41	4.19	1.89
Mode	11	10	3	16	11	2
	Powbrone			**Powbrone**		
	Quartz (n=35)			**Quartzite (n=47)**		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**
Maximum	29	37	11	65	77	19
Minimum	5	5	1	6	8	1
Average	14.8	13.49	4.43	21.53	20.62	5.83
STDEV	6.23	6.32	2.24	11.11	12.89	3.82
Mode	11	13	3	20	15	5

Table 6-10: Size dimensions of platform flakes deemed complete for measurement.

6.5.6 Blades

Blades account for 19.27% of the assemblage from Daer 85; Powbrone 16.25%, Daer 84 14.25%, Loch Doon 11.88% and Climpy 8.15%. The figures, apart from Climpy, are overstatements due to the low recovery of small fraction debitage and the nature of the recovery of the lithics.

A blade technology is determined by the *lamellar* index proposed by Bordes and Gaussen (1970). An arbitrary factor of 20, measuring the blades to blades and flakes combined, is the notional minimum requirement to confirm the presence of a blade technology. The *lamellar* indices are high at 30.55 for Daer 85; Daer 84 27.07, Powbrone 21.21 and Climpy 20.38. The index for the surface collections from Loch Doon is 14.90, which using the data compiled by Finlayson (1989, 164) from Starr 1 has a broad common difference at 16.07. Finlayson (1989, 150) makes the point that the *lamellar* index is based on the reduction of chalk flint; the fracture mechanics of raw materials of a lesser quality, such as chert, may require a lower index rating to determine the existence of a blade industry. Primary blades are rare across of the assemblages (Table 6-12).

	Climpy: Bipolar	%	Daer 84: Bipolar	%	Daer 85: Bipolar	%	Powbrone: Bipolar	%	Loch Doon: Bipolar	%
Blades										
Chert	10	16.67%	24	9.64%	17	5.92%	38	29.01%	21	23.08%
Flint					2	4.08%	12	26.67%	28	22.40%
Quartz							21	56.76%		
Quartzite							15	65.22%		
Total:	10		24		19		86		48	

	Climpy: Platform	%	Daer 84: Platform	%	Daer 85: Platform	%	Powbrone: Platform	%	Loch Doon: Platform	%
Blades										
Chert	50	83.33%	225	90.36%	270	94.08%	93	70.99%	70	76.92%
Flint	4	100%	9	100%	47	95.92%	33	73.33%	97	77.60%
Quartz							16	43.24%		
Quartzite							8	34.78%		
Total:	54		232		317		150		167	

Table 6-11: Numerical and percentage frequencies of bipolar and platform blades for the principal raw materials from the assemblages from Climpy, Daer 84, Daer 85, Powbrone and Loch Doon.

Figure 6.41: Chert platform blades from Daer 84.

	Chert	Bipolar	Platform	Flint	Bipolar	Platform
Daer 84						
Blades	249	24	225	9		9
Primary	5	1	4			
Secondary	45	6	39	5		5
Tertiary	199	17	182	4		4
Primary regular	1		1			
Primary irregular	4	1	3			
Secondary regular	23	3	20	2		2
Secondary irregular	22	3	19	3		3
Tertiary regular	96	1	95	4		4
Tertiary irregular	103	16	87			
Daer 85						
Blades	287	17	270	49	2	47
Primary	1	1		1		1
Secondary	63	7	56	22	2	20
Tertiary	223	9	214	26		26
Primary regular						
Primary irregular	1	1		1		1
Secondary regular	29	1	28	13		13
Secondary irregular	34	6	28	9	2	7
Tertiary regular	114	4	110	25		25
Tertiary irregular	109	5	104	1		1
Climpy						
Blades	60	10	50	4		4
Primary	2	1	1			
Secondary	19	6	13	2		2
Tertiary	39	3	36	2		2
Primary regular	1	1				
Primary irregular	1		1			
Secondary regular	10	4	6	2		2
Secondary irregular	9	2	7			
Tertiary regular	18	3	15	2		2
Tertiary irregular	21		21			

	Chert	Bipolar	Platform	Flint	Bipolar	Platform	Quartz	Bipolar	Platform	Quartzite	Bipolar	Platform
Powbrone												
Blades	131	38	93	45	12	33	37	21	16	23	15	8
Primary	1	1					2		2	1		1
Secondary	23	8	15	20	7	13	11	8	3	10	5	5
Tertiary	107	29	78	25	5	20	24	13	11	12	10	2
Primary regular							1		1	1		1
Primary irregular	1	1					1		1			
Secondary regular	9	3	6	8	3	5	1	1		5	3	2
Secondary irregular	14	5	9	12	4	8	10	7	3	5	2	3
Tertiary regular	46	11	35	19	4	15	5	4	1	5	5	
Tertiary irregular	61	18	43	6	1	5	19	9	10	7	5	2

Table 6-12: Character of blades from Climpy, Daer 84, Daer 85 and Powbrone by raw material and reduction strategy.

6.5.7 Bipolar blades

The attribute analyses are set out at Appendix I (Tables 10-32 to 10-36, inclusive). The bipolar blade populations (Table 6-12), although they could be more accurately referred to as 'blade-like flakes' (cf. Section 11), are generally low with increased incidences from Powbrone and Loch Doon. Flint is statistically exclusively used for platform reduction at Climpy, Daer 84 and Daer 85. The percentage utilisation of flint and chert equate for Powbrone and Loch Doon. Quartz and quartzite from Powbrone are the only raw materials where the percentage utilisation is greater for bipolar reduction strategies. This highlights raw material choices made specific to bipolar working which are not reflected elsewhere. The availability of quartz and quartzite are not restricted to Avondale and, therefore, these choices demonstrate different selection policies and possibly different temporal scales of activity in the vicinity of Powbrone. The character of the bipolar blades (Table 6-12) and the rarity of primary blanks suggest that the majority of nodular raw materials were opened elsewhere from the recovery location.

Simple platforms are preferred (Figure 6.42). The flint component from Powbrone is only nine blades and it is difficult to draw any firm conclusions from an analysis. Cortical platforms exceed simple platforms, which may be associated with the relatively high occurrence of tested flint pebbles where the testing strategy goes beyond the removal of one or two blanks prior to discard.

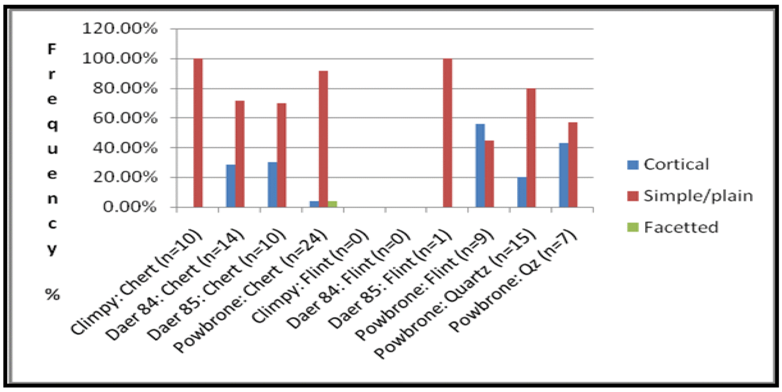

Figure 6.42: Percentage frequencies of platform types of bipolar blades where the form of the platform could be ascertained.

A softer hammerstone was the preferred percussor producing diffuse bulbs of percussion across the assemblages. The comparison of bipolar flakes and blades shows that a hard hammer resulting in a pronounced bulb has higher percentage occurrence for chert flakes from Daer 84 and Powbrone, and flint flakes from Powbrone with higher incidences for chert blades from Daer 85 and quartzite blades from Powbrone.

6.5.7.1 Proximal profile

Common differences are noted in the proximal profile of bipolar blades and bipolar flakes; although the low numerically frequency of the former makes it difficult to draw any firm conclusions from a direct comparison (Figures 6.37 and 6.43). There are statistical variations in the incidences of spalling and blanks where the proximal end is missing. The common differences indicate that blades are a result of the same technological processes, except for the desire to produce to produce 'blade-like flakes'.

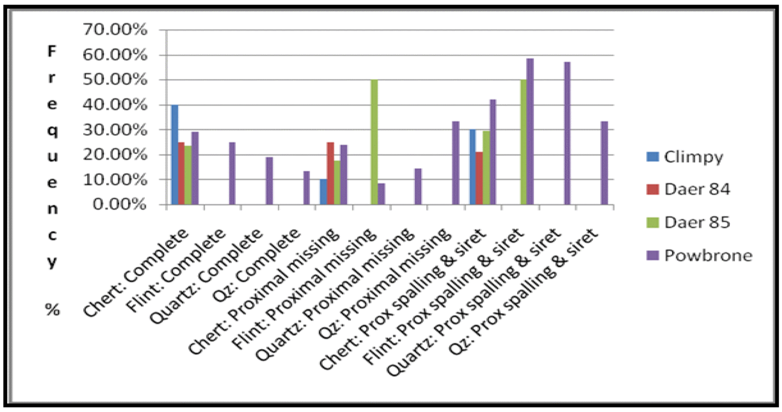

Figure 6.43: Percentage frequencies showing the proximal profile of bipolar blades by raw material.

6.5.7.2 Dorsal scarring patterns

The dorsal scarring patterns also indicate a largely common profile between blades and flakes from Daer 84 and Daer 85 with minor variations from Climpy and Powbrone (Figure 6.44). The chert blades from Climpy have evidence for a higher incidence of opposed scarring and a corresponding reduction in other scarring patterns. At Powbrone multi-directional scarring for chert indicates a common difference in the preferred orientation strategy, although the opposed scarring is increased following the pattern seen at Climpy. The flint and quartz from Powbrone shows a reverse in the patterning for multi-directional and opposed scarring when comparing blades to flakes. Longitudinal scarring dominates quartzite scarring for both blades and flakes.

Despite these subtle variations in core orientation strategies, i.e. the increase in opposed scarring, again gives weight to the suggestion that there is a generally consistent pattern in the directionality of re-orientation in the bipolar production of blades and flakes, although it must be stressed that the reduction processes for chert at Daer 84 and Daer 85 can be distinguished from Climpy and Powbrone.

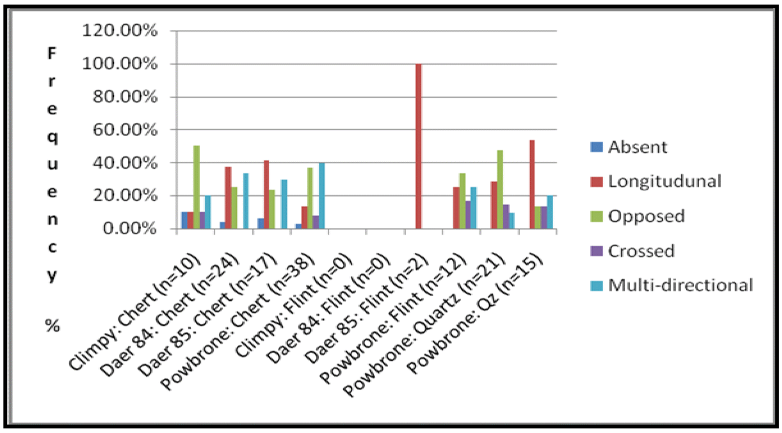

Figure 6.44: Percentage frequencies of dorsal scarring patterns of bipolar blades by raw material.

6.5.7.3 Dorsal surface

The analysis of the dorsal surface attributes of bipolar blades (Figure 6.45) parallels the data from bipolar flakes (Figure 6.35) with two potentially interesting anomalies. Firstly, there are fewer occurrences of step termination of the dorsal surface of blades from Climpy. Secondly, the reverse is noted at Daer 85 where there is a higher incidence of step terminations.

The mean metric data from Daer 85 indicates that chert bipolar blades are considerably longer and wider when compared to their counterparts from Daer 84 and Powbrone (Table 6-13), which is borne out in data of bipolar cores from Powbrone, although there is little to differentiate the mean core data for Daer 84 and Daer 85 (Figure 6.46). The production of these ‘longer flakes’ may have some bearing for the occurrence of step terminations. There are common differences in the average dimensions of chert blades from Climpy when compared to chert blades from Daer 84, and chert and flint blades from Powbrone (Figure 6.46). The STDEVs in the blades from Climpy are considerably lower which may indicate the desire to produce blades to a specific conceptual framework.

These variations may simply be a result of the vagaries associated with a bipolar reduction strategy or differential skill levels.

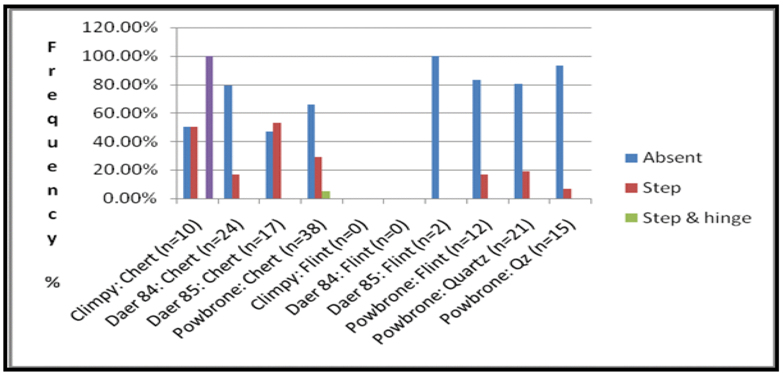

Figure 6.45: Percentage frequencies of the dorsal surface attributes of bipolar blades.

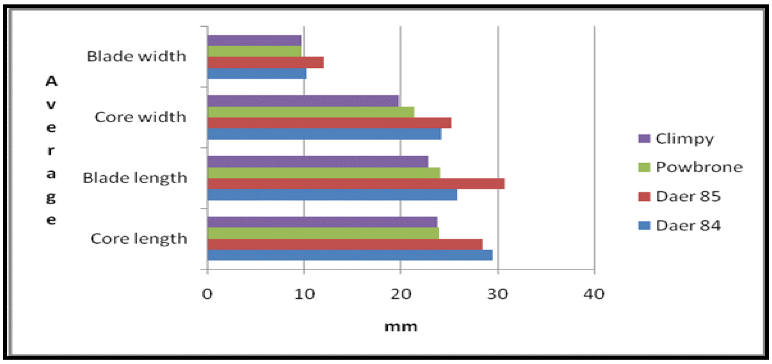

Figure 6.46: Comparison of average length and width of bipolar chert cores to bipolar chert blades from Daer 84, Daer 85, Powbrone and Climpy.

Daer 84 Chert Bipolar (n=15)	L mm	W mm	Th mm	Daer 85 Chert Bipolar (n=10)	L mm	W mm	Th mm
Maximum	36	15	12	Maximum	43	21	9
Minimum	11	4	2	Minimum	16	8	3
Average	25.8	10.2	5.4	Average	30.7	12	5.5
STDEV	7.43	3.14	3.09	STDEV	8.37	4.42	2.07
Mode	32	13	4	Mode	24	10	4

Powbrone Chert (n=28)	L mm	W mm	Th mm	Climpy Chert (n=10)	L mm	W mm	Th mm
Maximum	48	24	9	Maximum	27	13	6
Minimum	15	5	2	Minimum	20	7	3
Average	24.07	9.64	4.79	Average	22.8	9.7	4.1
STDEV	8.77	3.97	1.62	STDEV	2.39	2.11	0.99
Mode	15	7	5	Mode	20	8	4

Powbrone Flint (n=10)	L mm	W mm	Th mm
Maximum	34	12	7
Minimum	14	7	2
Average	23.3	9.6	4.5
STDEV	6.18	1.71	1.58
Mode	23	9	4

Quartz (n=17)	L mm	W mm	Th mm	Quartzite (n=9)	L mm	W mm	Th mm
Maximum	44	28	15	Maximum	63	23	15
Minimum	16	6	2	Minimum	23	7	4
Average	24.88	11.59	5.82	Average	40.56	15.78	8.78
STDEV	7.21	5.2	3.4	STDEV	14.65	5.95	4.09
Mode	21	10	3	Mode	28	23	10

Table 6-13: Size dimensions of bipolar blades.

6.5.8 Platform blades

The data from the attribute analyses of platform blades is shown at Appendix I (Tables 10-24 to 10-29, inclusive). Following the evidence from other blanks simple platforms were preferred for the removal of blades (Figure 6.47). Where there are relatively high incidences of cortical platforms this corresponds to those raw materials with low blade populations, although the pattern for quartz from Powbrone has common differences to platform flakes. The incidence of cortical platforms for flint blades from Daer 84 and Daer 85 is broadly consistent and at a higher percentage frequency than noted on flint platform flakes from Daer 85 (Figures 6.36 and 6.47). The platform profile for chert blades across the four sites is consistent with platform flakes.

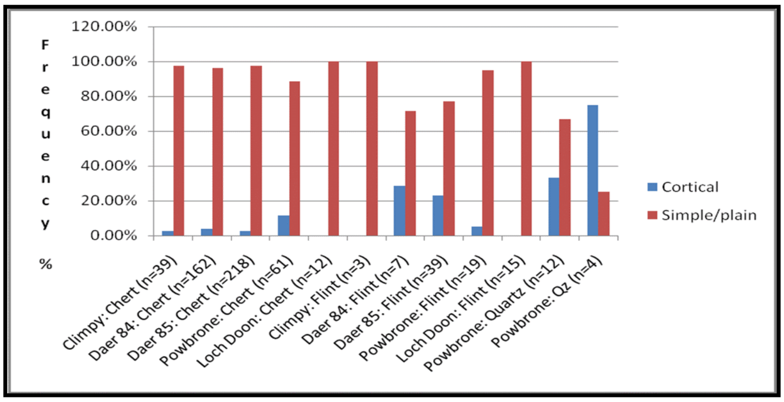

Figure 6.47: Percentage frequencies of platform types for platform blades where the form of the platform could be ascertained.

The use of a softer hammerstone producing a diffuse bulb of percussion is statistically exclusive for the removal of blades. Lip attributes are noted on chert and flint blades from Daer 84 and Daer 85, and chert blades from Powbrone. These attributes are most common from the Daer Valley sites, which replicates the pattern for platform flakes.

The profiles of the percentage occurrence of the scrub preparation of the core face for the production of chert blades and flakes are consistent with only minor variations across the assemblages (Figures 6.37 and 6.48). It is noted that there is a wider application of platform preparation for flint blades and flakes from Daer 85. It is possible that flint cores, as a curated and a non-local resource, were subject to a more rigorous core management strategy prior to striking blanks. This can be contrasted with the rarity of preparation for quartz and quartzite blades and flakes. The relatively high values for blades from Loch Doon have an inherent bias due to the sampling strategy adopted of choosing predominantly regular blades for analysis.

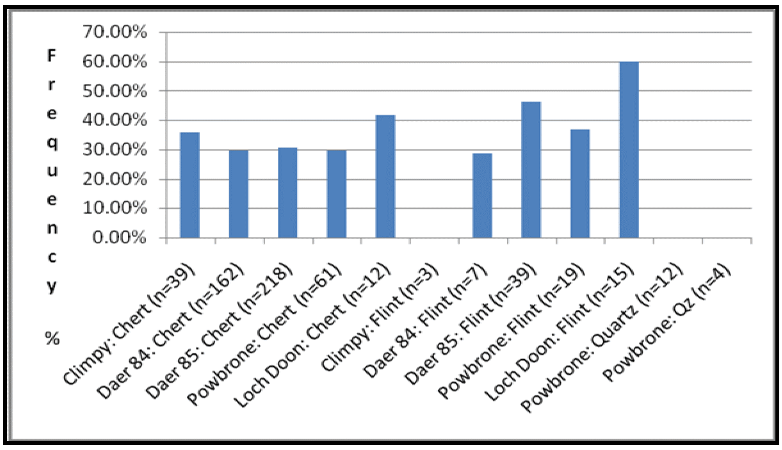

Figure 6.48: Percentage frequencies of scrub preparation to the core face prior to the removal of platform blades.

A potentially consistent pattern arises out of the analysis of the regularity of chert platform blades (Table 6-14; Figure 6.49). There appears to be a direct correlation of the regularity index to the *lamellar* index. The lower occurrences of regularity match the lower *lamellar* indices for Climpy (20.38%) and Powbrone (21.21%), with the reverse position for Daer 84 (27.07%) and Daer 85 (30.55%). The relatively small numbers of bipolar blades generally and the quartz and quartzite platform blades from Powbrone will have some impact on the statistical data but they do not meaningfully distort the figures. It could be argued that blade industries are represented by Daer 84 and Daer 85. While it cannot be contested that blades are a significant component within the assemblages from Climpy and Powbrone it is possible that a greater proportion of those blades, i.e. irregular blades, were manufactured as ‘blade-like flakes’.

The regularity indices for flint from Daer 85 and Powbrone also throw up a possible pattern which can be directly linked to platform preparation. It has been suggested that at Daer 85 flint cores were more carefully maintained and worked to facilitate blade production. A regularity index of 80.85% strengthens this interpretation. The percentage frequency of regular flint blades from Powbrone is noticeably higher when contrasted with chert blades. The profiles of platform preparation (Figure 6.48) and regularity (Table 6-14; Figure 6.49) may either suggest a direct correlation, or reflect variations in raw materials.

It should also be noted that the higher occurrences of platform preparation for chert blades from Daer 84 and Daer 85 converts into an increase in the regularity indices when compared to the relevant data from Climpy and Powbrone.

	Regular	%
Climpy		
Chert	22/50	44.00%
Flint	4/4	100.00%
Daer 84		
Chert	116/225	51.56%
Flint	6/9	66.67%
Daer 85		
Chert	138/270	51.11%
Flint	38/47	80.85%
Powbrone		
Chert	41/93	44.09%
Flint	20/33	60.61%

Table 6-14: Numerical and percentage frequencies of regular blades.

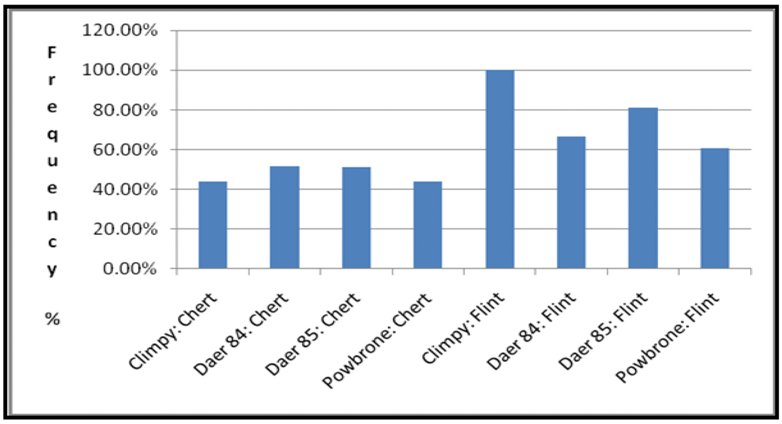

Figure 6.49: Percentage frequencies of regular blades.

6.5.8.1 Proximal profile

There are common differences in the variant proximal profiles for chert and flint blades from Daer 84, Daer 85 and Powbrone, except for an increased incidence of proximal spalling and *siret* fractures for flint blades from Daer 85 (Figure 6.50). Scrub preparation of flint appears to equate to relatively greater values for complete pieces.

Chert blades from Climpy are anomalous with lower frequencies for complete blades and higher occurrences for proximal spalling and *siret* fractures. In contrast to Climpy, it appears that the reduced levels of platform preparation for Powbrone blades have not had a detrimental effect on the percentage frequency of complete blades. The failure to produce complete chert blades at Climpy does not correspond to the evidence from flakes. This cannot be explained by the vagaries of raw material quality. A number of factors may account for this including but not necessarily exclusive to reduced platform preparation and possibly differential skill levels, which may speak to different agents and task differentiation.

The common differences for a missing proximal end in flakes and blades indicates a consistent pattern for the utilisation of blank segments for hafting/ retooling.

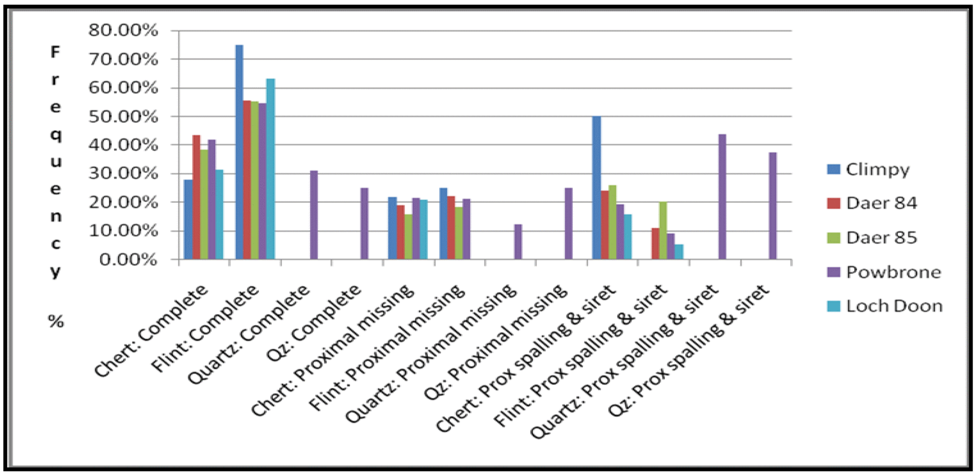

Figure 6.50: Percentage frequencies showing the proximal profile of platform blades by raw material.

6.5.8.2 Dorsal scarring patterns

Dorsal scarring patterns show that core orientation for chert is predominantly longitudinal for Climpy, Daer 84, Daer 85 and Loch Doon (Figure 6.52). The profile for Daer 84 and Daer 85 are comparable, and are analogous for both blades and flakes (Figures 6.38 and 6.52). There are greater incidences of longitudinal and opposed scarring at Climpy when compared to flakes, with a corresponding reduction in crossed and multi-directional core orientation.

Longitudinal and multi-directional core orientations for blades from Powbrone statistically equate. Opposed scarring, although more frequent than Daer 84 and Daer 85, is comparable to Climpy. Multi-directional attributes are more common on blades compared to flakes. This may suggest that blade cores were perhaps marginally more worked than flake cores, which is generally seen in the average length and thickness of the relevant cores, apart from Climpy although the sample size is small (Figure 6.51).

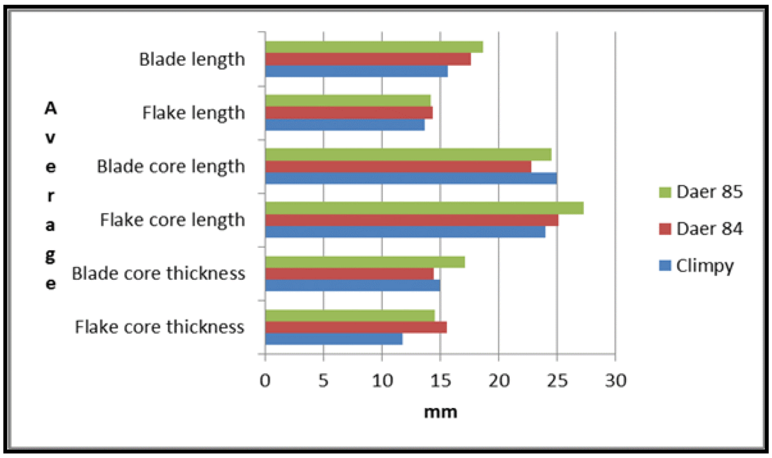

Figure 6.51: Comparison of mean lengths of chert blade cores, flake cores, blades and flakes from Climpy, Daer 84 and Daer 85.

The dorsal scarring patterns imply that the maintenance of blade cores was of a high standard at Climpy, Daer 84, Daer 85 and Loch Doon. The frequency of multi-directional scarring patterns from Powbrone indicates the possibility of a failure to maintain single and opposable platforms. However, with only one chert blade platform core in the assemblage it is difficult to be more precise about the anomalous evidence from Powbrone.

The profile of flint blades from Daer 85 is analogous to chert blades. There is a profound consistency in the reduction strategies for chert and flint blades and flakes from this site. The dorsal scarring pattern of flint blades from Powbrone parallels the data from Daer 85. There is, therefore, a marked variation in the working of flint which suggests different people were involved in the production of flint blades. The evidence from Daer 85 indicates that this cannot be exclusively due to the quality of raw materials and must be attributed to variations in skill of the agents who produced chert and flint blades at Powbrone. The maintenance of flint cores for the removal of blades at Daer 85, Powbrone and Loch Doon was undertaken to a high standard. This is further evidence for the potential of flint as a relatively scarce and important resource at certain inland locations.

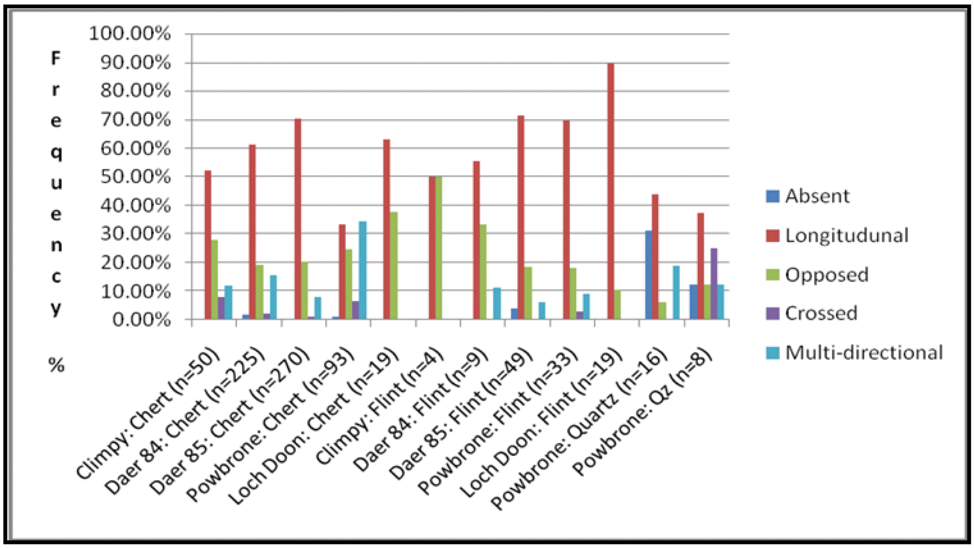

Figure 6.52: Percentage frequencies of dorsal scarring patterns of platform blades by raw material.

6.5.8.3 Dorsal surface

The analysis of dorsal surface attributes provides evidence for the efficient production of chert and flint blades with a clean dorsal surface (Figure 6.53). Most errors, i.e. step terminations are noted on chert blades from Climpy and Loch Doon.

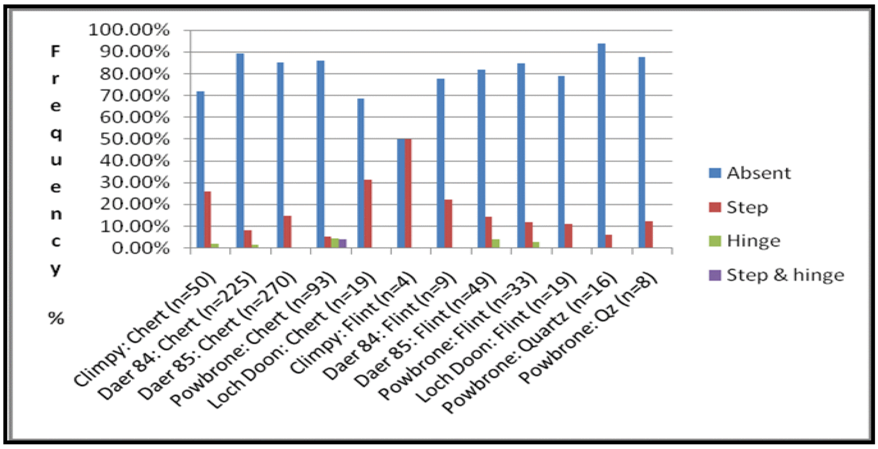

Figure 6.53: Percentage frequencies of the dorsal surface attributes of platform blades.

6.5.8.4 Size dimensions

In contrast to platform flakes the mean metric data shows increased variances, particularly in length, for chert and flint blades (Figure 6.54; Table 6-15). Apart from flint blades from Loch Doon the presence of a number of longer pieces distorts the mean data which is witnessed by relatively high values of STDEV (Table 6-15).

The modes for chert blades are within consistent parameters for Climpy, Daer 84 and Daer 85. Where there are high populations for analysis, e.g. Daer 84 and Daer 85, it is noted that the mean data is statistically analogous. The modes for Powbrone and Loch Doon imply a focus on the production of longer and marginally wider blanks (Table 6-15), a pattern which is recorded for the modes of flint blades from Daer 84, Daer 85 and Powbrone. These longer and wider blades should not be classified as 'blade-like flakes' because of the generally clear distinctions in the technological attributes associated with blade and flake production. The mean width of the blades from Loch Doon is statistically much greater (Table 6-15) which suggests an element of blade-like flake production.

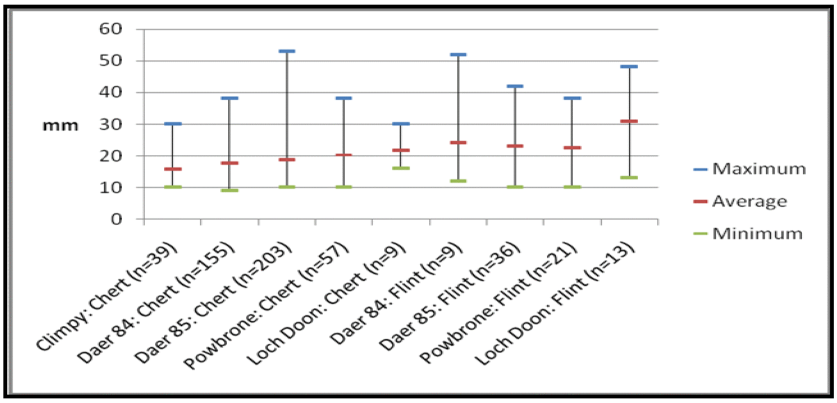

Figure 6.54: Metric data of the length of chert and flint platform blades deemed complete for measurement.

Daer 84				**Daer 85**			**Daer 84**		
Chert (n=155)				Chert (n=203)			Flint (n=9)		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**	L mm	W mm	Th mm
Maximum	38	14	10	53	19	15	52	20	12
Minimum	9	3	1	10	2	1	12	5	1
Average	17.63	6.94	3.14	18.71	7.03	3.24	24.22	9.89	4.22
STDEV	6.28	2.46	1.84	7.77	2.99	2.32	11.56	4.08	3.19
Mode	12	5	2	10	5	2	22	9	3
Climpy				**Powbrone**			**Daer 85** Flint		
Chert (n=39)				**Chert (n=57)**			(n=36)		
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**	L mm	W mm	Th mm
Maximum	30	12	8	38	29	9	42	18	7
Minimum	10	3	1	10	2	1	10	4	1
Average	15.67	6.56	2.77	20.18	7.91	3.79	22.97	8.42	2.83
STDEV	5.51	2.6	1.35	6.92	3.89	2.13	9.72	3.67	1.59
Mode	12	5	2	19	6	2	26	10	1
Loch Doon				**Loch Doon** Flint			**Powbrone** Flint		
Chert (n=9)				(n=13)			(n=21)		
	L mm	W mm	Th mm	L mm	W mm	Th mm	**L mm**	**W mm**	**Th mm**
Maximum	30	11	5	48	19	6	38	15	7
Minimum	16	3	2	13	9	1	10	4	1
Average	21.56	8	3.22	30.92	11.92	3.46	22.48	8.86	3.33
STDEV	4.56	2.55	1.2	8.3	2.63	1.45	7.47	3.07	1.71
Mode	23	9	2	23	10	2	22	10	3
Powbrone				**Powbrone**					
Quartz (n=13)				**Quartzite (n=6)**					
	L mm	**W mm**	**Th mm**	**L mm**	**W mm**	**Th mm**			
Maximum	36	13	12	50	17	9			
Minimum	12	5	2	18	7	3			
Average	18.92	7.46	4.23	32.67	11.83	6.17			
STDEV	6.12	2.37	2.59	13.17	3.82	2.64			
Mode	15	5	4	N/A	N/A	3			

Table 6-15: Size dimensions of platform blades deemed complete for measurement.

6.6 Edge damage

A number of different factors that may give rise to edge damage other than use induced edge damage, which may occur during the reduction process. None of the artefacts in the assemblages definitively present with attributes noted in experimental studies of post-depositional edge damage caused by ploughing (Mallouf 1982) and foot trampling (McBrearty *et al.* 1998). The greater majority of artefacts, including surface collections, are fresh which implies that they have been recovered from largely undisturbed ground surfaces, albeit not necessarily from *in situ* locations. This is said in the full knowledge that forestry trenching at Daer 84 and Daer 85 disturbed either old ground surfaces, or fossilised soil horizons from which lithics were recovered. Unless expressly noted otherwise, all of the artefacts are classified as having edge damage due to the fine trimming, as opposed to backing, of one or more edges. Trimming relates to the abrasion of an unretouched edge producing semi-invasive scalar removals. Invariably, trimming is undertaken to the full length of the edge indicating shaping to produce a straight edge. There are a number of blanks where the trimmed edge has notch attributes, which are not retouch in character. It is often not possible to determine if the notch is associated with either use, or an abandoned strategy to snap the blank, or unknown post-depositional taphonomic factors (after Kamminga 1982).

10 artefacts with edge damage were recovered from Climpy comprising of four chert blades, six chert and two flint flakes. Two chert flakes and one chert blade have post-depositional edge damage. Seven blanks can only be classified as having edge damage. Another piece with a proximal burination scar can also be classified as edge damaged. Edge damage to one chert flake was as a result of a bipolar manufacturing strategy.

Eight bipolar blades and flakes (seven of chert; one flint) from Daer 84 have edge damage associated with the reduction strategy. There are no examples from Daer 85. The 42 platform products from Daer 84 with edge damage comprise of 22 blades (chert 16; flint 6), and 20 flakes (chert 16; flint 4). 16 of the blades (72.73%) and four (20.00%) of the flakes are regular. This pattern is seen at Daer 85, although there is a higher incidence of using regular flakes. 66.67% of the edge damaged pieces are blades (chert 6; flint 8) of which 78.57% are regular (chert 4; flint 7). 57.14% of the chert (6) and flint (1) flakes with edge damage are regular.

At Loch Doon eight of the 12 blanks are blades with flakes as the remainder. Only two of the blanks are irregular.

3.54% of the assemblage from Powbrone has edge damage attributed to use-wear. This comprises of 19 retouched pieces and 33 (2.24%) debitage products. All of the attributed use-wear is noted on chert and flint debitage. There is edge damage to quartz and quartzite, although this has been assessed as relating to the reduction strategy and the quality of the raw material.

Blanks with edge damage from Weston comprise of 25 blades and 10 flakes, of which the majority are regular. 76.92% of blades and 60.00% of flakes have trimming to one or more edges. In addition, one blade and one flake have trimming which appears to be associated with a notch either caused by use, or some unknown post-depositional taphonomic factors. This trimming attribute appears to represent the shaping of the blank (cf. Section 7.3.6). Two of the blades, one each in flint and chert, present with sickle gloss. Both blades are regular. The flint artefact is a ‘true blade’ with parallel sides. The widths equate; lengths vary by 1mm and the chert blade is 2mm thicker. The artefacts may indicate a routine in the production of blades for specific tasks. The trimming of blanks and flakes at Daer Reservoir follows the pattern seen at Weston. None of the edge damaged artefacts can categorically be attributed to use.

Blanks with edge damage appear to fall into distinct patterns. Firstly, there is a propensity for regular blades and flakes at Climpy, Daer 85, Daer Reservoir, Loch Doon and Weston. Regularity ranges from 71.43% at Daer 85 to 83.72% at Weston. Secondly, irregular blanks are most common at Powbrone (69.70%) and Daer 84 (58.00%). It is possible that a greater number of regular blanks were modified or taken away from the sites. The greater incidence of bipolar working at Powbrone may have had some impact in the patterning; 11 of the 12 bipolar blanks are irregular. There are further common differences between Powbrone and Daer 84. The majority of blades are regular but the preponderance of flakes are irregular. This potentially distinguishes blades from flakes, where regular as opposed to irregular pieces were possibly chosen for use. However, it may be that certain blanks simply have a greater susceptibility to damage.

6.7 Discussion

Profound common differences of primary technological practice are evident in the assemblages. What can the fine grained analysis of the attributes of the raw materials, cores and debitage products tell us about the subtleties and nuances of variation in the character of primary technology and the raw materials at scales of intra-site and intra-regional variation?

Statistically all of the artefacts from the excavated assemblages from Climpy, Daer 84, Daer 85, Daer Reservoir and Weston are fresh, which may signify that they were either recovered from largely undisturbed surfaces, or indicate the nature of the artefact bearing soil matrices. It is only at Climpy where it can be said with any degree of certainty that the majority of the artefacts were recovered from an old ground surface. The sites at Daer 84 and Daer 85 had been disturbed by forestry trenching, and it is not clear whether the 'undisturbed surface' was either an old ground surface, or a fossilised soil horizon. From a preliminary report of the test pits dug by Barrowman (nd.) at Weston, the lithics were recovered from the top soil and a sand layer which had been disturbed by ploughing, although excavations undertaken in 2003 and 2004 did locate truncated features cut into this sandy natural (Ward 2006). Hillwash and the fluctuations in the levels of Daer Reservoir and Loch Doon together with other unknown taphonomic factors may have some bearing on the finds location of artefacts.

The Shannon-Weaver Diversity for raw material (Figure 6.55) illustrates the dominance of chert as the preferred raw material at Climpy, Daer 84 and Daer 85. The higher index for Weston reflects a decrease in chert (77.08%), and an increase in the frequency of flint artefacts (21.83%). Daer Reservoir signals flint as the principal raw material (60.56%); chert 33.55%. The occurrence of other raw materials is more widespread at Daer Reservoir when compared to Weston, with chalcedony (3.10%) and 'blue stone' (2.17%) making a relatively small but informative presence. Flint (46.83%) and chert (45.56%) statistically equate at Loch Doon with a significant incidence of chalcedony (3.10%). There is a plethora, although numerically low, of other materials which in the main are from Powbrone. The character of the agate from Loch Doon and the chalcedony, jasper, mudstone and pitchstone from Powbrone, and the pitchstone and quartzite from Weston may relate to later non-Mesolithic activities. The removal of these artefacts from the assemblages does not unduly alter the factors for the diversity of raw materials (Figure 6.55).

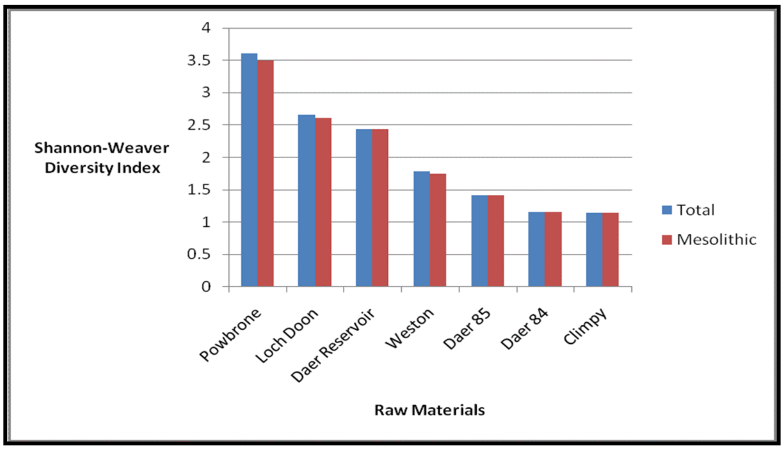

Figure 6.55: Diversity of raw materials using the Shannon-Weaver Diversity Index for the recorded assemblages and after reductions for those artefacts deemed to be non-Mesolithic.

All of the primary and secondary chert artefacts from Powbrone display a smooth/hard cortex; a pattern which is replicated in the assemblage from Climpy. The majority of the primary flint blanks from Powbrone are tested split pebbles indicating local reduction of material collected from riverine locations such as Glengavel Water and/or Powbrone Burn, although cortical evidence suggests that some of the flint may derive from beach pebbles brought to the site in a reduced state. The vein quartz, although coarser grained than the flint and chert, is of a quality suitable for the production of blanks using both bipolar and platform reduction strategies (after Lindgren 2003 and Ballin 2008). The presence of quartz at Powbrone should not infer that it was chosen as a substitute for chert or flint, e.g. quartz is not generally an appropriate material for manufacturing formal tool forms (after Rankama *et al*. 2006, 255; Ballin 2008). The quartz artefacts at Powbrone may either represent later periods of activity during the Mesolithic period, or the broadly contemporaneous reduction of a material to produce specialised flakes for unmodified use.

The quality of the flint, where present, is homogenous; fine grained producing a clean conchoidal fracture. The greatest variance in the quality of chert is at Climpy. Generally, the chert used for microliths has a finer grain, fewer inclusions which create fracture planes. In contrast, the mixed quality of the debitage products does not match the cores which, apart for one burnt chert core, are of an inferior quality. It seems probable that pre-prepared cores of good quality curated Ordovician chert were brought to Climpy. Local resources of poorer quality Carboniferous chert were probably used as a supplementary resource to avoid, unless necessary, the use of curated material.

The attributes of the cortical surface of chert chosen for reduction demonstrates that Daer 84 can be distinguished from Daer 85. The variation of raw material as identity markers forces us to consider not only different temporal events with inferences to the significance of different places for procurement, but also potentially different claims to place and rights to resources by different hunter-gatherer groups. The quality of the chert is comparable, comprising of a mixture of fine and coarser grained chert. The presence of inclusions creating fracture planes is noted, although noticeably less frequent than seen in the chert artefacts from Climpy. The quality of the chert from Daer 84 and Daer 85 is representative of the chert recovered from Daer Reservoir, Loch Doon and Powbrone.

Daer Reservoir was dammed in 1956. It is probable that there are numerous locations with evidence of Mesolithic occupation beneath the inundation. Daer Reservoir stands apart from the other inland assemblages. It is not only the primacy of flint as the preferred raw material of choice, but also the occurrence of distinctive bluish-grey hues of raw materials (Figure 6.56) and the presence of the siliceous ‘blue stone’.

Figure 6.56: Bluish-grey flint debitage from Daer Reservoir 1.

The quality of the flint and chalcedony belies the fact that, apart from Climpy, Daer Reservoir has the highest incidence of platform cores (5 flint; 1 chalcedony) being abandoned due to flaws (11.54%). Five of the six cores are non-specific platform cores. This may suggest that the person(s) working these cores was consistently attempting to re-orient the cores to work around the flaws and attempt to prolong their working life. The size of the discarded cores suggests that this was not an altogether successful strategy. The occurrence of 'blue stone' at only two of the nineteen locations suggests different episodes of activity by different hunter-gatherer groups. The excavated sites at Daer Reservoir are less than 4km south-east of Daer 84 and Daer 85, which makes the unique character of the raw materials even more surprising. Where were these raw materials sourced? If they were not harvested locally then it would be reasonable to expect that they would be found at other sites as curated materials. It is possible that these other activity areas are within the archaeological record but remain undiscovered. The consistency of these raw materials across the locations in and around Daer Reservoir suggests that they were probably sourced locally.

An overview taken of the assemblages from Daer Reservoir, in comparison to Climpy, Daer 84 and Daer 85, suggests that that there is a higher frequency of primary blanks, although a scarcity of tested materials. Whether the preliminary conclusions drawn are sustainable or the general character of the assemblage corresponds to a bias in recovery it is not possible to ascertain. What can be said is that it is likely that a high proportion of raw materials were either opened at source, or some other location before being brought to Daer Reservoir.

The profile of the blanks from Weston, again from an overview of the assemblage, suggests the primary knapping of raw materials was undertaken. Based on the analysis of the excavated assemblages in this study Weston is potentially unique in this regard.

Bipolar and platform reduction strategies were adopted at all of the sites in this study. It is important to restate that cores are classified by the negative scars of the last removals prior to discard, and bipolar blanks will be understated because they will not always display attributes relating to bipolar reduction. The main raw material components, namely chert, flint, quartz and quartzite, were all used for bipolar and platform reduction. Quartzite from Powbrone was predominantly used for bipolar working, and flint from Loch Doon is largely associated with platform reduction. Platform blanks from Climpy, Daer 84, Daer 85 and Powbrone have attribute evidence for the anvil support of the core, which suggests that bipolar and platform reduction were coeval. None of the sampled flakes and blades from Daer Reservoir, Weston and Loch Doon presented with evidence of anvil support. This may be due to sample bias on the basis of the relatively small number of artefacts chosen for technological analysis, although a substantial number of other blades and flakes were unsuccessfully scrutinised for these particular attributes.

There are common differences in core rejuvenation and core maintenance. Rejuvenation is effected by detaching blanks to remove negative step/hinge attributes from the flaking surface. Overshot blanks also removed accumulations of material to the distal end of the core. There is a pattern of transverse removals from the left representing a strategy to detach part of the surface of the platform. Removals could also be effected from the right, although no instances were recorded in the assemblages within this study. Many of the opposed platform cores have a sub-ordinate platform which is used to maintain the working conical shape of the core. These cores are not truly opposed on the basis that the platforms for removals were not alternating.

The presence of a blade industry at Climpy, Daer 84, Daer 85 and Powbrone has been established using the arbitrary *lamellar* index. The impression gained from an assessment of the Daer Reservoir and Weston assemblages suggests that blade industries may also be associated with these sites. Barrowman (nd.) makes this point from an initial analysis of the artefacts from his test pits at Weston. McCartan (1998) in cataloguing surface collections from Weston notes the presence of a blade industry. The artefacts analysed by Barrowman and McCartan appear to be of mixed provenance, including Neolithic facies. On the basis of the *lamellar* index alone there was not a blade industry at Loch Doon, although this may be a result of the inherent bias in surface collections.

The majority of blanks are a product of platform reduction utilising simple platforms with varying degrees of evidence for platform preparation prior to their detachment. A softer hammerstone was the preferred percussor on the basis that negative scarring to cores and blanks show that diffuse bulbs of percussion dominate the assemblages. Lip attributes which also suggests the use of a softer hammer are present in relatively low numbers.

The bipolar blades or blade-like flakes generally display relatively good percentage frequencies for regularity, except for Daer 85 (cf. Table 6-12). This may indicate high skill levels in the use of the bipolar technique to produce blade-like flakes, which may imply that these artefacts were manufactured to a conceptual and strategic aim. Does this indicate different temporal events? The matter is confused by the continuity of technological practice. For example, there are broad common differences in the proximal profile of bipolar flakes and blades and platform flakes and blades across the raw materials and the assemblages, except for flint platform blades. This may indicate that the production of bipolar blade-like flakes and platform blades were coeval across much of the Mesolithic period.

Generally up to 40.00% of the blanks are complete. The incidence of proximal spalling and *siret* fracturing to the blank exceeds those pieces with the proximal end missing. It is most probable that the proximal spalling and *siret* fractures are associated with reduction process, which cannot be simply explained away by variations in the quality of raw material and may be categorised as knapping errors. The absence of the proximal end may be a result of fracture mechanics indicating a lack of support to the core face when blanks are removed, although the frequency suggests that platform blanks are being snapped following removal, without displaying any attributes associated with this strategy, and used for retooling. This strategy may not have been appropriate for the majority of flint platform blades where there is a higher incidence of complete blanks ranging from 54.55% to 75.00%, with a greater percentage frequency for a missing proximal end when compared to the data for proximal spalling and *siret* fractures.

There are distinct differences. Firstly, the Mesolithic occupation of the Daer Valley sees the bipolar production of *pièces esquilées*, also referred to either as scalar pieces or wedges, at both Daer 84 and Daer 85, which are not present at the other sites apart from one burnt *pièce esquilée* from Powbrone. Secondly, Weston may also be distinguished as the only site where blanks are shaped by trimming to one or more edges.

6.8 Summary

The primary technologies identify the connections and disconnections in the *chaîne opératoire* and define the character of the primary artefacts within the assemblages. The evidence from technological analysis of the assemblages demonstrates the continuity of technological practice across the *longue durée* of the Mesolithic period of West Central Scotland which is marked by the contemporaneous use of bipolar and platform reduction, the common differences of platform type, core rejuvenation and maintenance strategies, percussors, the presence of blade industries, and the utilisation of blank segments for retooling. These technological traits although common are present at varying scales at different locations.

Raw materials show marked distinctions in the choice and diversity of raw materials on an intra-regional scale. These variations as identity markers indicate different temporal episodes, different hunter-gatherer groups and potentially different claims and rights to resources. Sub-types of raw material highlight intra-site variability at Climpy, Daer 84 and Daer 85. Colouration of raw materials indicates both intra-site and inter-site variation, e.g. Daer Reservoir.

For example, intra-regional technological variation is seen in the reworking of platform cores at Powbrone, the frequencies of non-specific platform cores at Daer Reservoir and Weston, and *pièces esquillées* at Daer 84, Daer 85 and Powbrone. Variations in the nature, chronology and interpretive issues relating to the primary technologies of the inland occupations of West Central Scotland are considered in Chapter 8.

Chapter 7: Secondary technology of lithic practice for inland events in South Ayrshire and South Lanarkshire during the Mesolithic period

7.1 Introduction

This chapter characterises the secondary technologies exploited in the inland occupations of South Ayrshire and South Lanarkshire to determine variation at intra-site and inter-site scales of enquiry.

7.2 Raw material, type, frequency and diversity

There is a wide range of raw materials for blanks with secondary modification (Tables 7-1). Chert dominates at Climpy (97.56%), Daer 84 (89.19%), Daer 85 (80.36%), Weston (76.25%) and Powbrone (72.50%). Modified flint is most common at Daer Reservoir (61.86%) and Loch Doon (56.67%). An analysis of Finlayson's (1989, 166-167) data shows that the primacy of flint at Loch Doon is also seen in the assemblages from Starr 1 (60.98%) and Starr 2 [66.67%] (Table 7-2). The percentage parameters at the other sites range from 2.44% for Climpy to 22.79% at Weston.

The density populations for other raw materials are low. It is possible that artefacts fashioned in pitchstone from Powbrone and Weston refers to later pre-historic random events. The subsequent figures do not include one pitchstone scraper from Powbrone and three pitchstone artefacts with miscellaneous retouch from Weston. The numerical and percentage frequencies of artefacts with secondary modification are given at Table 7-3 and Figure 7.1, respectively.

	Total	Chert	Flint	Chalcedony	Blue Stone'	Siltstone
Climpy						
Microliths	23	23				
Microlith fragments	10	10				
Scrapers	2	1	1			
Truncations						
Other	6	6				
	41	40	1			
Daer 84						
Microliths	42	39	3			
Microlith fragments	14	12	2			
Scrapers	28	25	3			
Truncations	1	1				
Other	26	22	4			
	111	99	12			
Daer 85						
Microliths	54	40	14			
Microlith fragments	11	9	2			
Scrapers	33	29	1			3
Truncations	3	3				
Other	11	9	2			
	112	90	19			3
Daer Reservoir						
Microliths	99	36	60	1	2	
Microlith fragments	34	7	23	3	1	
Scrapers	46	22	23		1	
Truncations	6		5		1	
Other	30	6	22	1	1	
	215	71	133	5	6	

	Total	Chert	Flint	Chalcedony	Agate	Pitchstone
Loch Doon						
Microliths	2	2				
Microlith fragments						
Scrapers	21	9	12			
Truncations						
Other	7	2	5			
	30	13	17			
Powbrone						
Microliths	4	2	2			
Microlith fragments	3	2	1			
Scrapers	22	18	2		1	1
Truncations	2	1	1			
Other	9	6	3			
	40	29	9		1	1
Weston						
Microliths	558	432	123	3		
Microlith fragments	155	117	36	2		
Scrapers	54	44	10			
Truncations	34	22	12			
Other	37	24	10			3
	838	639	191	5		3

Table 7-1: Artefacts with secondary modification from Climpy, Daer 84, and Daer Reservoir by raw material.

	Starr 1			Starr 2		
	Total	**Chert**	**Flint**	**Total**	**Chert**	**Flint**
Microliths	17	8	9	10	3	7
Microlith fragments	6	1	5	2	1	1
Scrapers	12	6	6			
Oblique truncations	4	1	3			
Other	43	16	27			
	82	32	50	12	4	8

Table 7-2: Artefacts with secondary modification from Starr 1 and Starr 2 (Finlayson 1989, 166-167).

	Climpy	Daer 84	Daer 85	Daer Reservoir	Loch Doon	Powbrone	Weston
Microliths	23	42	54	99	2	4	558
Microlith fragments	10	14	11	34		3	155
Oblique truncations						2	20
Microburin		1	3	6			4
Notch & snap							8
Lamelle à *cran*							2
Scraper	2	28	33	46	21	21	54
Abruptly backed				1			
Thin backed		1	2		1	3	
Point		1					
Denticulate	3	4	1	1	3	1	3
Notch		5	3	2		2	4
Awl		1		1			
Miscellaneous retouch	3	14	5	25	3	3	27
	41	111	112	215	30	39	835

Table 7-3: Numerical frequency of artefacts with secondary modification.

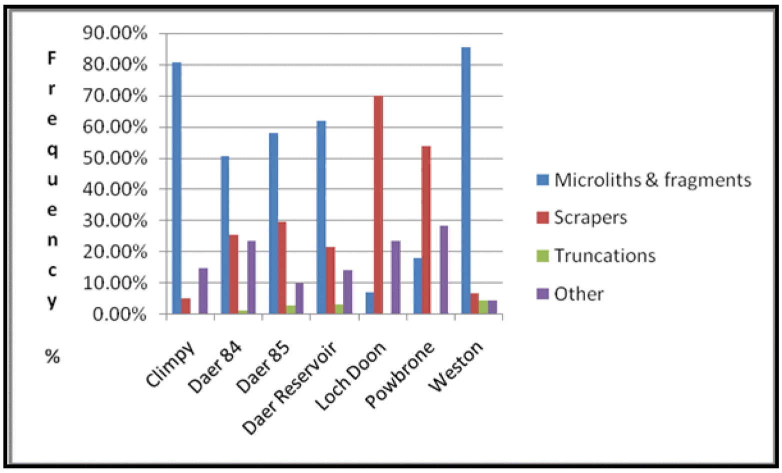

Figure 7.1: Percentage frequencies of artefacts with secondary modification.

For the excavated sites, namely Climpy, Daer 84, Daer 85 and Weston, microliths dominate the secondary technology component of the assemblages ranging from 85.39% at Weston to 50.46% at Daer 84 (STDEV ±15.00%).

The frequency of scrapers falls within a percentile standard deviation of ±4.03% for Daer 85, Daer 85 and Daer Reservoir. The excavated assemblages with the highest percentage frequency of microliths, i.e. Climpy and Weston have the lowest incidence of scrapers at 4.87% and 6.47%, respectively. The reverse situation is noted in the surface collections from Loch Doon and Powbrone where microliths are rare and scrapers account for more than 50.00% of the retouched artefacts. Scrapers are common in later periods of prehistory (Finlay *et al.* 2000a, 583), and it may be that some of the artefacts relate to post-Mesolithic events. There are small concave end scrapers with invasive retouch in the collections from Loch Doon. These artefacts are typologically associated with Bronze Age events. It is also possible that these percentile parameters are partially a result of a bias in recovery because of the difficulty in recognising and recovering microlith forms.

Truncations are exceptional in percentage terms, although present in all assemblages apart from Climpy and Loch Doon. A flint oblique truncation with microlithic retouch, typical of Late Mesolithic forms, was recovered from outwith the main scatter area at Climpy (Innes *et al.* forthcoming).

Other retouched forms, including those with miscellaneous retouch, have been recorded from each of the locations. It is possible to place these artefacts into two arbitrary categories for the purpose of analysis and interpretation. Firstly, the percentage frequency from Climpy, Daer 85, Daer Reservoir and Weston is less than 15.00% (STDEV ±4.86%) and, secondly for Daer 84, Loch Doon and Powbrone where the percentile range is greater than 20.00% (maximum 28.20%; minimum 22.50%; STDEV ±2.78%). The potential bias in recovery for Loch Doon and Powbrone may hide an inherent overstatement in the proportion of these other retouched artefacts.

Figure 7.2 illustrates the percentage frequency of retouched artefacts in the assemblages from the excavated sites. The frequency of retouched artefacts from Daer 84 and Daer 85 are probably overstated due to the low recovery of small fraction debitage. The rate of recurrence from Weston (2.00%; 2.11% including artefacts with edge damage only) is more representative of percentile frequencies. For example, the average percentage frequency from the eight sites excavated for the SHMP (Finlay *et al.* 2000, 571) is 2.06% (STDEV ±0.941%). To illustrate the point, it is known that the recovery rate of small fraction debitage from Climpy, even though wet sieving was not undertaken, was very good at 46.88% (Innes *et al.* forthcoming). If this percentile of small fraction debitage had been achieved during the excavations at Daer 84 and Daer 85, the percentage frequency of retouched artefacts would reduce to 4.78% and 4.34% from 6.13% and 6.35%, respectively. The incidence of retouched artefacts, although remaining high, would have broad common differences to Climpy at 5.22% (average 4.78%; STDEV ±0.44%).

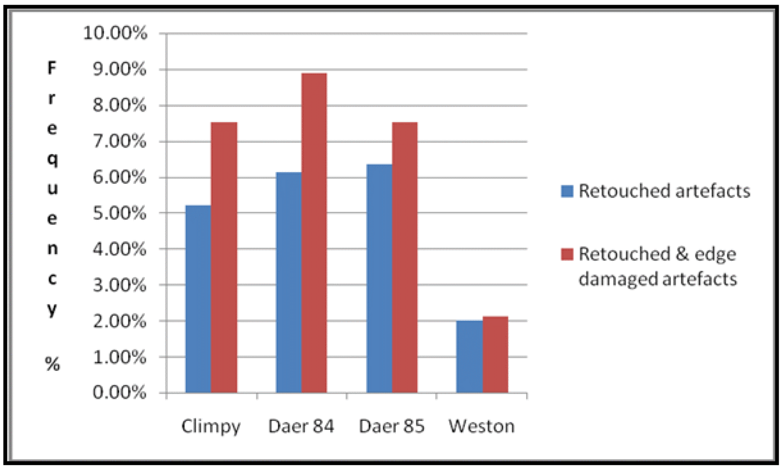

Figure 7.2: Percentage frequencies of retouched artefacts from the excavated assemblages.

Using the Shannon-Weaver Diversity Index (Section 5.3) the greatest diversity of retouched artefacts at 2.93 is seen in the assemblage from Daer 84, where microliths, microlith fragments and scrapers are well represented in the assemblage, although there is only one truncation. Other forms have a greater diversity when compared to the other sites. The diversity indices for Daer 85 and Daer Reservoir statistically equate at 2.72 with Powbrone marginally lower at 2.71. All four groups (see Section 5.3) are represented. The diversity of other non-miscellaneous retouch forms is wider, although numerically equal, for Daer 85 with miscellaneous retouched artefacts dominating the ‘other’ classification at Daer Reservoir. Loch Doon with a diversity index of 2.16 has a high frequency of scrapers, no truncations and low numbers for microliths and microlith fragments and other retouched pieces. The retouched component of the assemblages from Climpy and Weston are the least diverse with indices of 1.83 and 1.77, respectively. This is due to the high percentage frequency of microliths and microlith fragments.

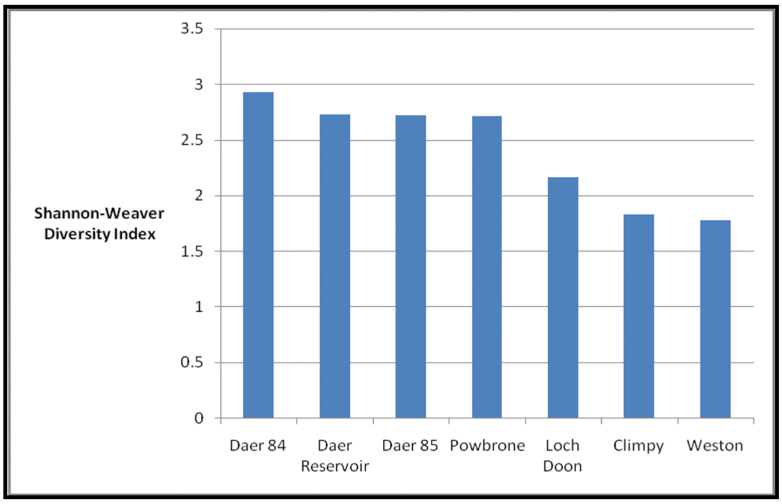

Figure 7.3: Diversity of retouched artefacts using the Shannon-Weaver Diversity Index.

It has been established that microliths were not manufactured in the excavated area at Climpy; re-tooling was undertaken (Innes *et al.* forthcoming), i.e. where either pre-prepared microliths or platform blank segments are hafted to replace those which have been discarded. In contrast, the presence of microburins at Daer 84 and Daer 85 suggests that microliths were manufactured. The relatively low percentage frequency of secondary chert platform flakes and blades at Daer 84 and Daer 85, when compared to Climpy (Tables 6-16 and 6-30), may indicate a preference for certain blanks chosen for the manufacture of microliths. This pattern is noted in the assemblages from Bolsay Farm and Staosnaig (Finlay *et al.* 2000a, 573).

7.3 Microliths

Finlayson (1989; 1990; 1990a) incorporated Torrence's (1983; 1989a) concepts of time stress, risk avoidance and the most expedient use of energy when considering microliths from Starr 1 and Smittons. The use-wear analysis of microliths from these two inland assemblages also proved the multi-functionality of microliths. Use-wear analysis shows that the tool motion for flint is largely longitudinal, with roughly equal frequencies of longitudinal and transverse attributes for chert. Unlike the microlith assemblage from Smittons, where the microliths display either impact damage or longitudinal striations indicating use as component for projectiles, there was no uniform use-wear attributes. The range of visible striations from tool motion included bi-directional, transverse and piercing motions. The lack of longitudinal attributes, together with the rounded edges of the microliths, suggested that they were utilised for tasks other than as projectiles (Finlayson 1990, 47-48; Finlayson 1990a, 3). David (1998, 201) suggested that microliths would have been used for a wide range of craft related activities such as drilling and the processing of food resources.

Tables 7-4 and 7-5 show the numerical and percentage frequency of microliths by type and raw material. The percentile occurrence of raw materials used in the manufacture of microliths and microlith fragments is illustrated at Figure 7.4.

72.45% of all microliths and microlith fragments are chert; flint 26.36%, chalcedony 0.89% and ‘blue stone’ 0.30%. The sites can be categorised by the choice of raw materials used. Firstly, chert represents more than 90.00% of raw materials at Climpy and Daer 84. Secondly, the sites where the percentage frequency for the utilisation of flint is more common, e.g. Daer 85 (24.62%) and Weston (22.30%). Thirdly, Daer Reservoir can be distinguished for the characteristics of raw material choice. The presence of the enigmatic ‘blue stone’ which appears to be unique to this location, the bluish grey hue of chert, and it is the only site where flint (62.41%) exceeds chert (32.33%) as the preferred raw material for the manufacture of microliths.

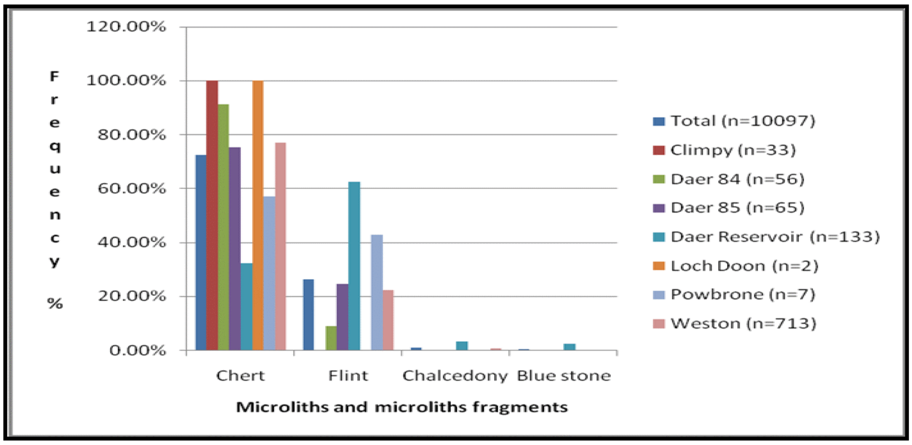

Figure 7.4: Percentage frequencies of raw materials used for microliths.

The microliths from Daer Reservoir come from 19 different locations in and around the reservoir. Three of the sites have been excavated by BAG. The 33 microliths from Site 2 are chert; chert cores 90.91%, flint cores 9.09%. This contrasts with Sites 1 and 3 where flint microliths account for 86.36% and 80.65%, respectively of the microlithic assemblage. All of the cores from Site 3 are flint; Site 1 76.92% (Figure 7.5).The only ‘blue stone’ microliths were recovered from Site 1. Apart from the 'blue stone' which is exclusive to Site 1 and only one other location, the distinctive colour hues of raw material indicate a possible common source of raw material. The statistically exclusive use of chert as a primary material for the modification of blanks at Site 2, and the presence of 'blue stone' at Site 1 may indicate different periods of occupation. The higher incidence of chert and chalcedony microliths at Site 3 in comparison may also speak to different temporal scales, for which there is limited evidence from radiocarbon dating (see Chapter 8). The character of the microliths further illustrates the pattern of variation across these sites. At Site 2 the most frequent form of microlith is backed bladelets followed by scalene triangles; the reverse is seen at Sites 2 and 3 (Figure 7.6).

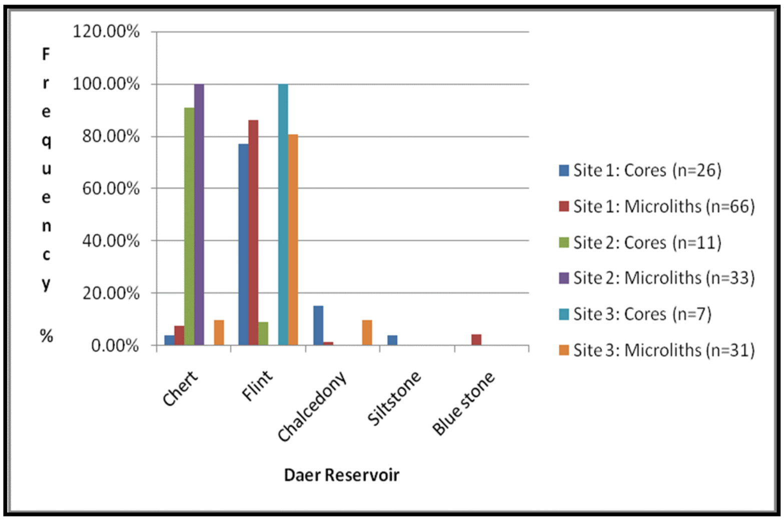

Figure 7.5: Percentage frequency of cores and microlithic artefacts from Sites 1, 2 and 3 at Daer Reservoir.

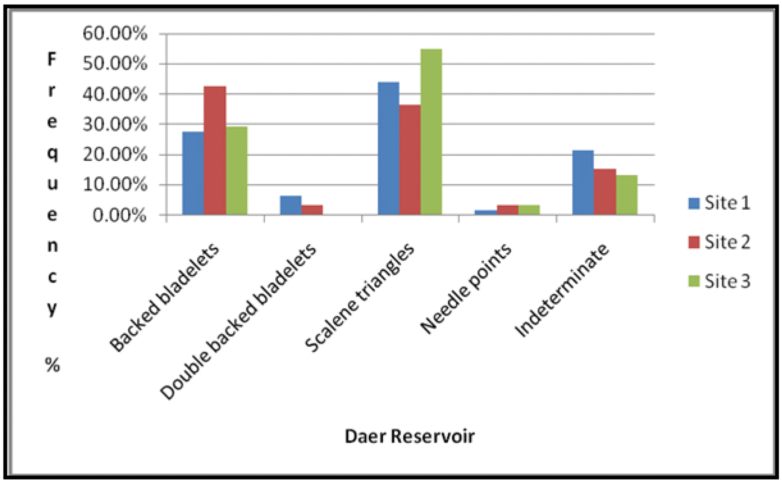

Figure 7.6: Percentage frequency of microlithic forms from Sites 1, 2 and 3 at Daer Reservoir.

The percentage frequency of microlith forms highlights three separate possible patterns. For the purposes of illustration, backed bladelets and double backed bladelets are grouped together into one microlithic form. Firstly, there is Climpy where scalene triangles dominate (73.90%) with low occurrences of backed bladelets and other forms. Secondly, Daer Reservoir (50.50%) and Weston (67.20%) where scalene triangles account for more than 50.00% of microlith types with a substantial frequency of backed bladelets (Daer Reservoir 39.40%; Weston 24.02%). Thirdly, Daer 84 and Daer 85 which is the reverse of Daer Reservoir and Weston, where backed bladelets are the most common form of microlith (Daer 84 66.66%; Daer 85 59.25%) with a significant percentage frequency of scalene triangles (Daer 84 26.19%; Daer 85 31.49%).

The microliths from Starr 1 and Starr 2 fall within the second grouping where the incidence of scalene triangles is 50.00% or more (Table 7-6). Chert is the dominant material for backed bladelets from Starr 1, with flint preferred for scalene triangles from Starr 2 (Finlayson 1989, 166-168; 194). Starr 1 is the only location in this study where a trapeze microlith has been recovered, although variation is also noted in considering the indeterminate forms from Climpy and Daer Reservoir. These variations may indicate different temporal events.

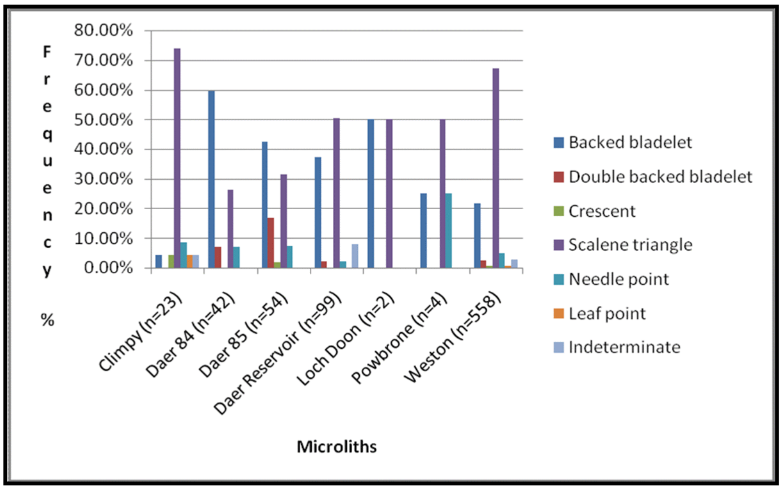

Figure 7.7: Percentage frequency of microlith types.

Figure 7.8: Microliths from Daer Reservoir 1. © Alan Saville used with permission.

	Total	%	Chert	%	Flint	%	Chalcedony	%	Blue Stone'	%
Climpy										
Backed bladelet	1	4.35%	1	4.35%						
Double backed bladelet										
Crescent	1	4.35%	1	4.35%						
Scalene triangle	17	73.90%	17	73.90%						
Needle point	2	8.70%	2	8.70%						
Leaf point	1	4.35%	1	4.35%						
Indeterminate	1	4.35%	1	4.35%						
	23	100.00%	23	100.00%						
Daer 84										
Backed bladelet	25	59.52%	23	54.76%	2	4.76%				
Double backed bladelet	3	7.14%	2	4.76%	1	2.38%				
Crescent										
Scalene triangle	11	26.19%	11	26.19%						
Needle point	3	7.15%	3	7.15%						
Leaf point										
Indeterminate										
	42	100.00%	39	92.86%	3	7.14%				
Daer 85										
Backed bladelet	23	42.59%	15	27.78%	8	14.81%				
Double backed bladelet	9	16.66%	7	12.96%	2	3.70%				
Crescent	1	1.86%			1	1.86%				
Scalene triangle	17	31.49%	16	29.63%	1	1.86%				
Needle point	4	7.40%	2	3.70%	2	3.70%				
Leaf point										
Indeterminate										
	54	100.00%	40	74.07%	14	25.93%				
Daer Reservoir										
Backed bladelet	37	37.38%	17	17.18%	20	20.20%				
Double backed bladelet	2	2.02%	2	2.02%						
Crescent										
Scalene triangle	50	50.50%	14	14.14%	33	33.33%	1	1.01%	2	2.02%
Needle point	2	2.02%	1	1.01%	1	1.01%				
Leaf point										
Indeterminate	8	8.08%	2	2.02%	6	6.06%				
	99	100.00%	36	36.37%	60	60.60%	1	1.01%	2	2.02%

Table 7-4: Numerical and percentage frequency of microliths by type and raw material from Climpy, Daer 84, Daer 85 and Daer Reservoir.

	Total	%	Chert	%	Flint	%	Chalcedony	%
Loch Doon								
Backed bladelet	1	50.00%	1	50.00%				
Double backed bladelet								
Crescent								
Scalene triangle	1	50.00%	1	50.00%				
Needle point								
Leaf point								
Indeterminate								
	2	100.00%	2	100.00%				
Powbrone								
Backed bladelet	1	25.00%	1	25.00%				
Double backed bladelet								
Crescent								
Scalene triangle	2	50.00%	1	25.00%	1	25.00%		
Needle point	1	25.00%			1	25.00%		
Leaf point								
Indeterminate								
	4	100.00%	2	50.00%	2	50.00%		
Weston								
Backed bladelet	121	21.69%	93	16.67%	27	4.84%	1	0.18%
Double backed bladelet	13	2.33%	10	1.79%	3	0.54%		
Crescent	3	0.54%	2	0.36%	1	0.18%		
Scalene triangle	375	67.20%	295	52.87%	79	14.15%	1	0.18%
Needle point	27	4.83%	19	3.40%	8	1.43%		
Leaf point	3	0.54%	1	0.18%	1	0.18%	1	0.18%
Indeterminate	16	2.87%	12	2.15%	4	0.72%		
	558	100.00%	432	77.42%	123	22.04%	3	0.54%

Table 7-5: Numerical and percentage frequency of microliths by type and raw material from Loch Doon, Powbrone and Weston.

	Starr 1	%	Starr 2	%
Complete				
Scalene triangles	10	47.62%	5	50.00%
Crescent	2	9.52%		
Point	1	4.76%		
Backed bladelet	3	14.29%	5	50.00%
Oblique truncations	4	19.05%		
Trapeze	1	4.76%		
	21	100.00%	10	100.00%
Fragments				
Indeterminate	6	100.00%	2	100.00%

Table 7-6: Numerical and percentage frequency of microliths by type (Finlayson 1989).

The diversity of microlith forms using the Shannon-Weaver Diversity Index is shown at Figure 7.9. There are only two microliths from Loch Doon comprising of one backed bladelet and one scalene triangle with a resultant diversity index of 2. The index for Powbrone is 2.83 which is a factor based on two scalene triangles, one needle point and one backed bladelet. This illustrates the importance of any variation in the diversity index, e.g. if there only two forms at Powbrone instead of three the index would reduce from 2.83 to 2. The other sites fall into three possibly distinct categories. Firstly, Daer 85 (3.64) has a broad range of microlith types; in order of numerical and percentage frequency, backed bladelets, scalene triangles, double backed bladelets needle points and a crescent. Secondly, Daer Reservoir and Daer 84 have indices of 2.92 and 2.82, respectively. Other than scalene triangles, backed bladelets and double backed bladelets there are only three needle points in the Daer 84 assemblage. A wider array of forms is present from Daer Reservoir, however, the dominance of scalene triangles and backed bladelets effectively reduces the diversity index. Thirdly, the indices statistically equate for Weston (2.69) and Climpy (2.67). These sites have the highest occurrence of scalene triangles. Non-scalene triangles make up only 26.10% of microliths from Climpy comprising of five different forms. Weston is the only site where all seven forms of microlith are present, however, the relative numerical frequency of non-scalene and non-backed bladelets is low, although needle points represent 4.83%. The diversity indices suggest the specialisation of certain microlith forms at Climpy and Weston, which corresponds to the domination of microlith forms in these assemblages (Figure 7.8). This distinctive pattern was highlighted at Bolsay Farm when comparison was made to the other SHMP assemblages where the variation has been interpreted as signifiers to palimpsests of different diachronic events (Finlay *et al*. 2000, 574). The domination of a specific microlith form is not uncommon, e.g. crescents at Fife Ness (Wickham-Jones and Dalland 1998), and scalene triangles at Auchareoch (Affleck *et al*. 1988).

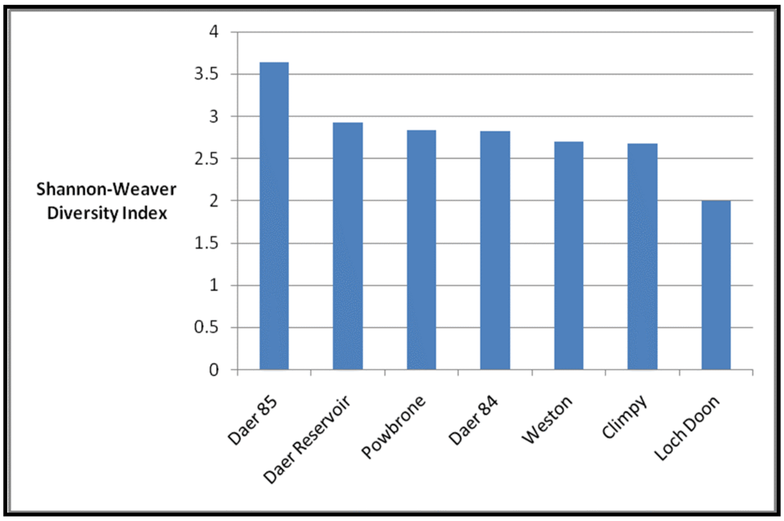

Figure 7.9: Diversity of microlith types using the Shannon-Weaver Diversity Index.

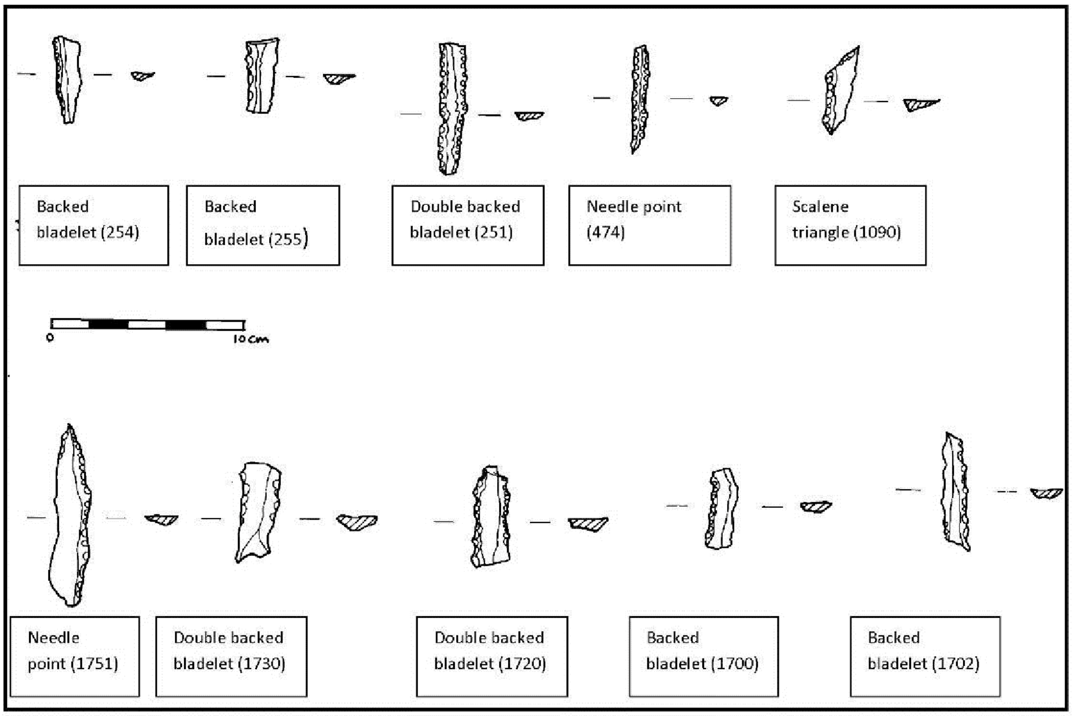

Figure 7.10: A selection of microliths from Daer 84 (top row) and Daer 85 (bottom row).

7.3.1 Microlith attributes

The microliths from Loch Doon and Powbrone and the flint microliths from Daer 84 although included in the illustrative figures will not feature in the textual analysis because of the low populations within the assemblages. The attribute analyses of chert and flint microliths are shown at Tables 7-7 and 7-8.

	Climpy	Daer 84	Daer 85	Daer Reservoir	Loch Doon	Powbrone	Weston
Curvature Dorsal							
Straight	1	13	12	16	1		74
Irregular	1	15	12	6		1	58
Shallow	1						2
Curved	1						2
Sub-angular	8	5	10	6			154
Angular	11	6	6	8	1	1	142
	23	39	40	36	2	2	432
Curvature Ventral							
Straight	2	16	13	16	1		74
Irregular		12	11	6		1	58
Shallow							2
Curved	2						2
Sub-angular	5	5	9	6			154
Angular	14	6	7	8	1	1	142
	23	39	40	36	2	2	432
Angle Position							
None	2	28	24	22	1	1	135
Bottom Quarter	10	4	6	8	1	1	77
Middle	1						
Top Quarter	10	7	10	6			220
	23	39	40	36	2	2	432

		Climpy	Daer 84	Daer 85	Daer Reservoir	Loch Doon	Powbrone	Weston
Base								
Indeterminate					1			1
Bulb Present		7	12	13	2			68
Break Snap		3	22	19	30		1	235
Burin Snap		3	3	7				9
Flat								2
Angled/Curved		10	2	1	3	2	1	117
		23	39	40	36	2	2	432
No. Of Retouched Edges								
	1	1	23	18	20		1	105
	2	9	8	18	9	2		263
	3	11	8	4	7		1	52
	4	2						12
		23	39	40	36	2	2	432
Retouch Type								
Abrupt		18	15	18	22	2	1	319
Enclume		5	23	14	7		1	110
Semi-abrupt				7	7			3
Semi-invasive			1	1				
		23	39	40	36	2	2	432
Point								
No point		19	36	38	31	1	2	391
Single Sided		2	1		4	1		21
Double Sided		2	2	2	1			20
		23	39	40	36	2	2	432

Table 7-7: Attribute analysis of chert microliths.

	Daer 84	Daer 85	Daer Reservoir	Powbrone	Weston
Curvature Dorsal					
Straight	2	4	7		10
Irregular	1	8	19	1	31
Shallow					1
Curved		1			2
Sub-angular		1	23		47
Angular			11	1	32
	3	14	60	2	123
Curvature Ventral					
Straight	2	4	7		10
Irregular	1	8	19	1	31
Shallow					1
Curved		1			2
Sub-angular		1	23		47
Angular			11	1	32
	3	14	60	2	123
Angle Position					
None	3	13	27	1	44
Bottom Quarter		1	10	1	22
Middle					
Top Quarter			23		57
	3	14	60	2	123

	Daer 84	Daer 85	Daer Reservoir	Powbrone	Weston
Base					
Indeterminate					1
Bulb Present	1	3	13	1	25
Break Snap	2	9	46	1	61
Burin Snap		1	1		2
Flat		1			
Angled/Curved					34
	3	14	60	2	123
No. Of Retouched Edges					
1	2	8	35		33
2	1	4	24	1	70
3		2	1	1	13
4					7
	3	14	60	2	123
Retouch Type					
Abrupt	1	6	29	1	80
Enclume	1	6	30	1	42
Semi-abrupt	1	2	1		1
Semi-invasive					
	3	14	60	2	123
Point					
No point	3	12	55	1	110
Single Sided			4		5
Double Sided		2	1	1	8
	3	14	60	2	123

Table 7-8: Attribute analysis of flint microliths.

7.3.1.1 Dorsal and ventral curvature

Figures 7.11 to 7.14, inclusive show the percentage frequencies of the attributes for the dorsal and ventral curvature for chert and flint microliths. The preponderance of angular/sub-angular and straight/irregular attributes highlights the dominance of scalene triangles, backed bladelets and the presence of double backed bladelets and needle points in the assemblages. The low incidence of curved and shallow retouch shapes demonstrates the paucity of curved forms, such as crescents and leaf points.

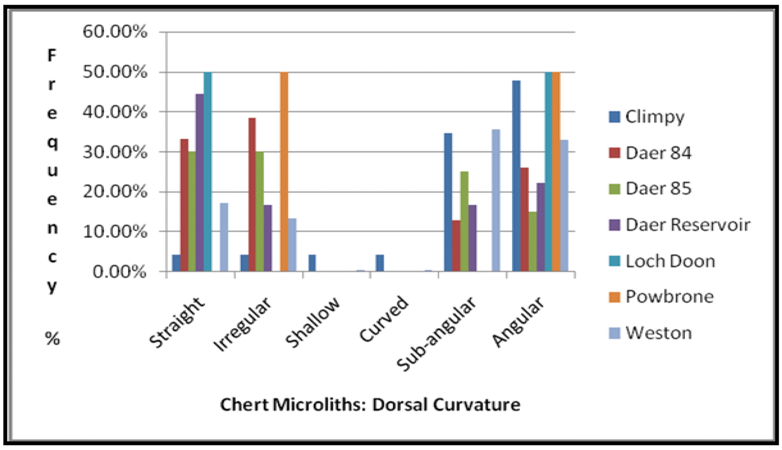

Figure 7.11: Percentage frequency of shape of retouch for dorsal curvature of chert microliths.

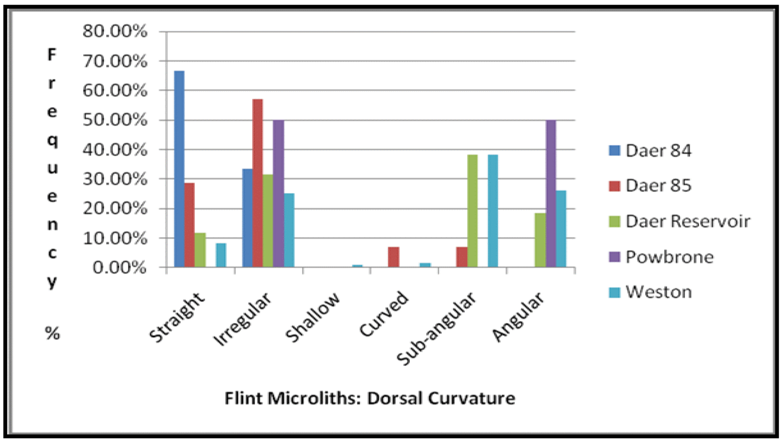

Figure 7.12: Percentage frequency of shape of retouch for dorsal curvature of flint microliths.

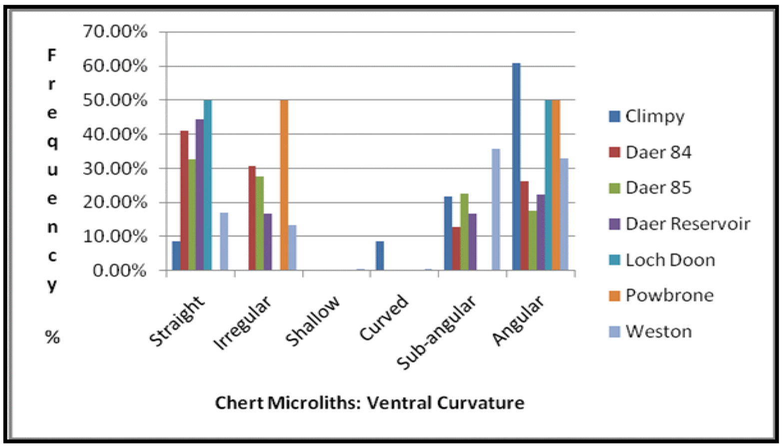

Figure 7.13: Percentage frequency of shape of retouch for ventral curvature of chert microliths.

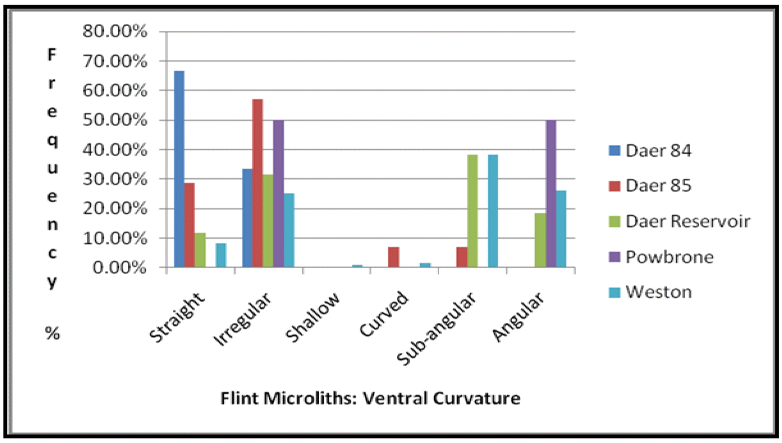

Figure 7.14: Percentage frequency of shape of retouch for ventral curvature of flint microliths.

7.3.1.2 Angle position

Based on the microlith forms within the assemblages the presence of an angle position refers in the main to scalene triangles, with the absence referring to non-scalene triangle forms. Where an angle is recorded on chert microliths, the dominance of a top quarter angle position is seen at Weston 78.85%; Daer 84 63.63% and Daer 85 62.50%. The frequency of a top quarter and a bottom quarter angle at Climpy equates with one microlith presenting with a middle angle. It is only at Daer Reservoir where the incidence of a bottom quarter angle position (57.14%) is greater than the top quarter position [42.86%] (Figure 7.15).

The top quarter angle position is more common on flint microliths from Daer Reservoir (69.70%) and Weston [72.15%] (Figure 7.16). While this pattern is seen in the chert microliths from Daer Reservoir the evidence from Weston implies that either different people were manufacturing flint scalene triangles, and/or potentially different temporal episodes of activity. This interpretation is also supported in other criteria arising out of the technological analysis.

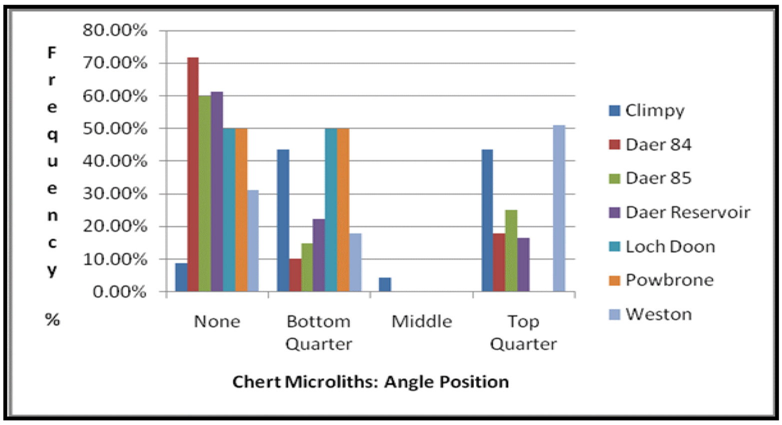

Figure 7.15: Percentage frequency of angle position on chert microliths.

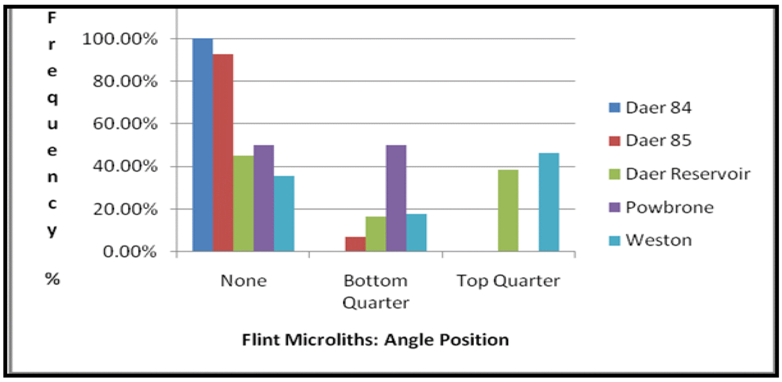

Figure 7.16: Percentage frequency of angle position on flint microliths.

7.3.1.3 Basal morphology

The break snap is the most common basal attribute for chert and flint microliths at 54.10% and 58.91%, respectively. Angled retouch is recorded on 23.73% of chert; flint 16.83%. 21.29% of flint has a bulb of percussion; chert 17.80%. Burin snaps are more frequent for chert at 3.84%; flint 1.98%. Flat bases are rare with only two chert examples from Weston (0.35%) and one flint at Daer 85 (0.49%).

Daer 84 and Daer 85 have the most consistency of common differences in basal forms for both chert and flint microliths. Daer 85 has the highest incidence of burin snaps for chert and flint, followed by Climpy for chert. The percentage frequencies of chert basal forms distinguish Climpy, Daer Reservoir and Weston. The more limited evidence for flint shows broad common differences for Daer 84, Daer 85 and Daer Reservoir with Weston again distinguished (Figures 7.17 and 7.18).

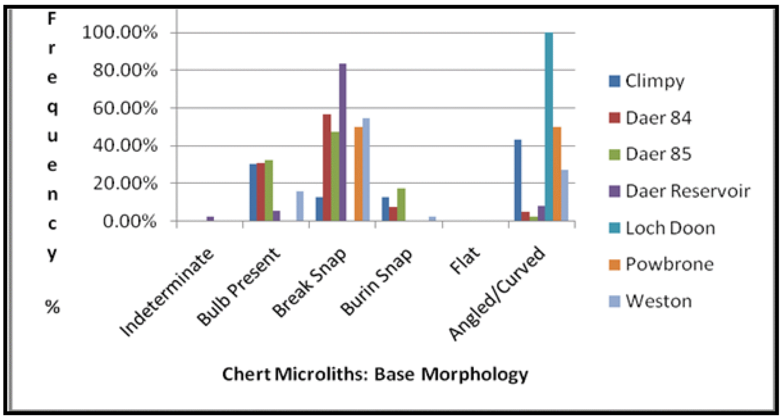

Figure 7.17: Percentage frequency of basal forms for chert microliths.

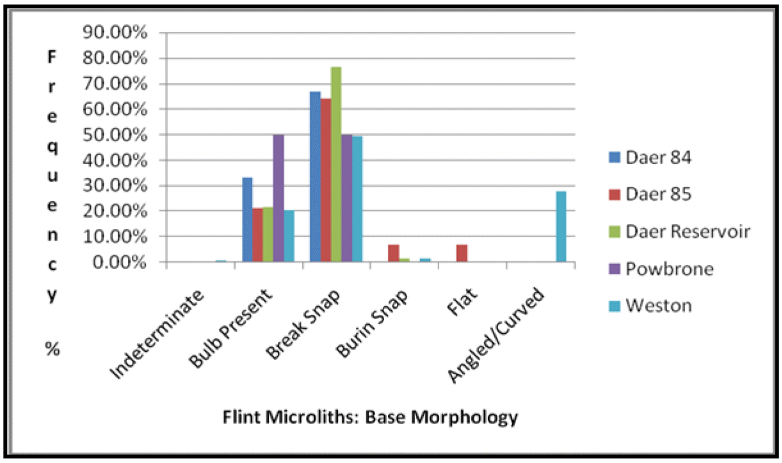

Figure 7.18: Percentage frequency of basal forms for flint microliths.

7.3.1.4 Number of retouched sides

The blank is assumed to be rectangular with the potential for four retouched edges. 53.83% of chert microliths have two retouched edges; flint 49.50%, 29.27% have one retouched edge; flint 38.62%. Three retouched edges are present on 14.46% of chert forms; flint 8.41, 2.44% have retouch to all four edges; flint 3.47%.

Daer 84 and Daer Reservoir have the greatest degree of common difference for chert microliths, with wide variances for Climpy, Daer 84 and Weston. 47.83% of chert from Climpy has three retouched edges, Daer Reservoir has 60.87% with one retouched edge, and statistically the forms from Daer 85 with one and two retouched edges equate at 45.00%. Microliths with all four edges retouched are only seen in the assemblages from Climpy (8.70%) and Weston [2.78%] (Figure 7.19).

Flint microliths from Daer 85 (57.40%) and Daer Reservoir (58.33%) have common differences for the frequency of one retouched edge; Daer Reservoir has 40.00% with two retouched edges; Daer 85 28.57%, 1.67% has three retouched edges; Daer 85 14.29%. 56.91% of Weston microliths have two retouched edges; one 26.83% and three 10.57%. Flint artefacts with retouch to all four sides are recorded from Weston [5.59%] (Figure 7.20).

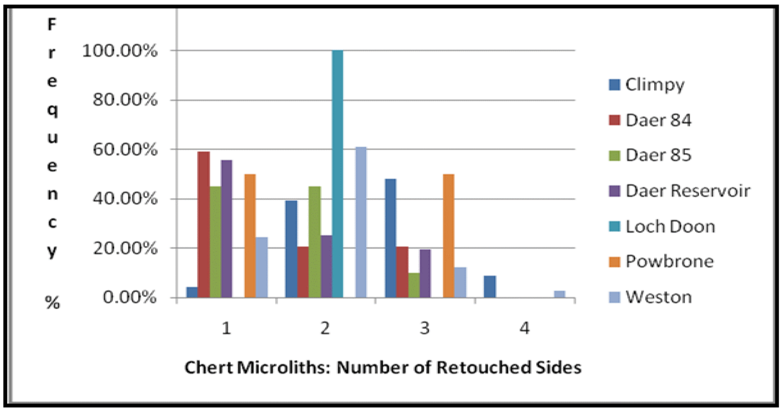

Figure 7.19: Percentage frequency of retouched edges to chert microliths.

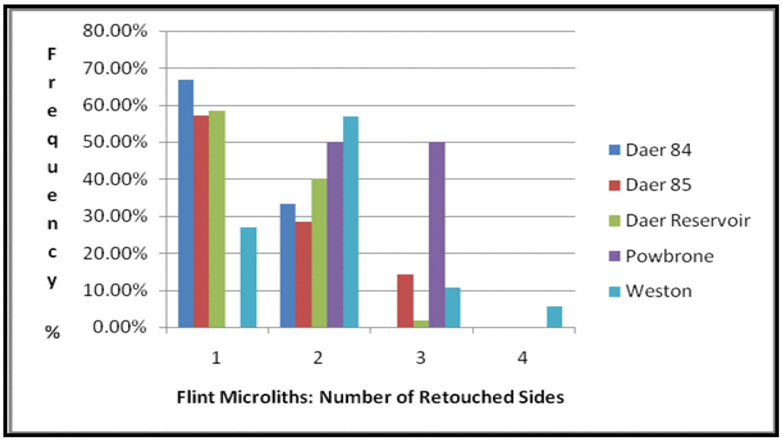

Figure 7.20: Percentage frequency of retouched edges to flint microliths.

7.3.1.5 Point character

The point attributes for chert microliths from Climpy, Daer 84, Daer 85, Daer Reservoir and Weston equate. The range for single sided retouch is 11.11% at Daer Reservoir to 2.56% for Daer 84, with double sided points most frequent at Climpy (8.69%) and least common at Daer Reservoir [2.78%] (Figure 7.21).

There are no single sided points from Daer 85 in either chert or flint. The incidence of single side retouch is 6.67% for Daer Reservoir; Weston 4.07%, with double sided retouch most frequent at Daer 85 at 14.29%; Weston 6.50% and Daer Reservoir 1.66% (Figure 7.22).

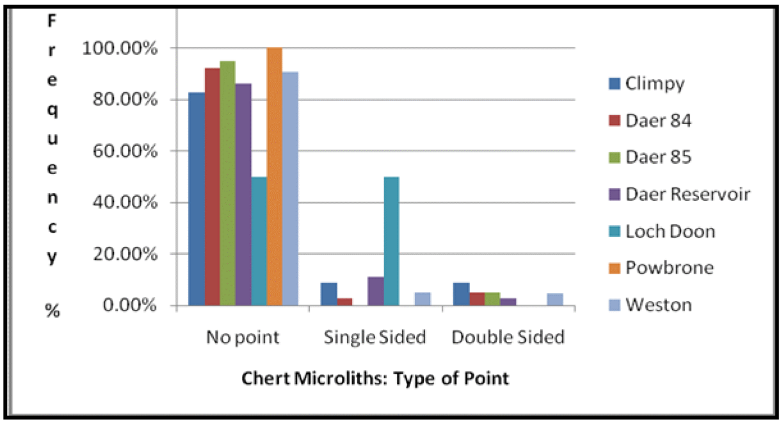

Figure 7.21: Percentage frequency of point character for chert microliths.

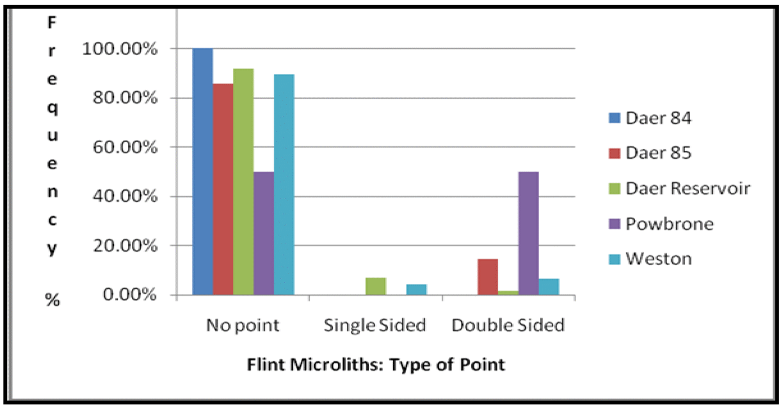

Figure 7.22: Percentage frequency of point character for flint microliths.

7.3.1.6 Type of retouch

The type of retouch to chert distinguishes Daer 84 and Daer 85. 58.98% of the pieces from Daer 84 have *enclume*; Daer 85 35.00% with abrupt/semi-abrupt retouch at 38.46%; Daer 85 62.50%. The incidence of *enclume* retouch for Weston, Climpy and Daer Reservoir is 25.46%, 21.74% and 19.44%, respectively. Abrupt/semi-abrupt retouch is in excess of 70.00% at these three sites (Figure 7.23).

There is a marked difference in the occurrences of the form of retouch for flint. *Enclume* is most frequent at Daer Reservoir at 50.00% followed by Daer 85 42.86% and Weston 34.15%. The limited evidence does suggest a greater use of the anvil for the manufacture of flint microliths (Figure 7.24), which is also seen in the production of blanks at Climpy, Daer 84, Daer 85 and Powbrone (cf. Section 6.6).

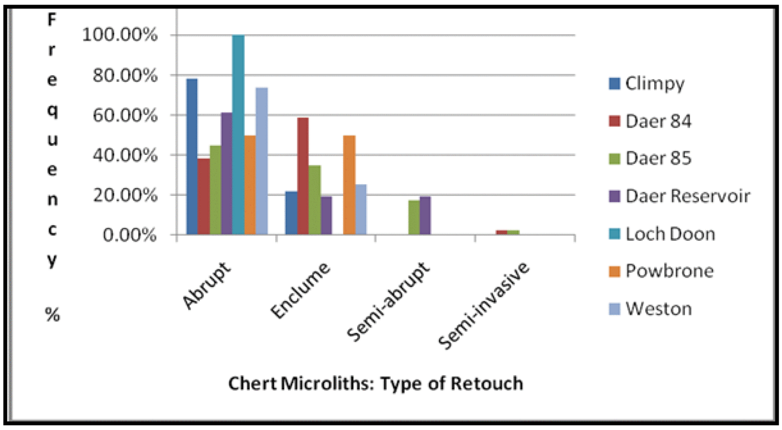

Figure 7.23: Percentage frequencies of the type of retouch for chert microliths.

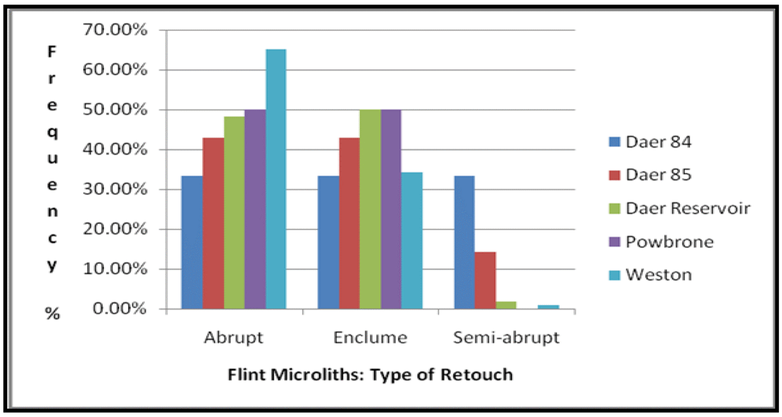

Figure 7.24: Percentage frequencies of the type of retouch for flint microliths.

There is no discernible patterning in the form of retouch to microlith thickness, except for Daer 85 where *enclume* is preferred for microliths with a thickness greater than 1mm (Table 7-9). These variations may suggest different routines possibly linked to different episodes of activity.

Retouch	Total	%	Thickness 1mm	%	2mm	%	3mm	%	4mm	%
Abrupt										
Climpy	18	78.26%			15	83.33%	3	16.67%		
Daer 84	16	38.10%	3	18.75%	11	69.75%	2	12.50%		
Daer 85	24	44.44%	14	58.33%	9	37.50%	1	4.17%		
Daer Reservoir	51	53.13%	25	49.02%	24	47.06%	2	3.92%		
Weston	399	71.89%	256	64.16%	127	31.83%	14	3.51%	2	0.50%
Enclume										
Climpy	5	21.74%			3	60.00%	2	40.00%		
Daer 84	24	57.14%	11	45.83%	10	41.67%	3	12.50%		
Daer 85	20	37.04%	6	30.00%	13	65.00%	1	5.00%		
Daer Reservoir	37	38.54%	22	59.46%	15	40.54%				
Weston	152	27.39%	65	42.77%	80	52.63%	7	4.60%		
Semi-abrupt										
Daer 84	1	2.38%			1	100.00%				
Daer 85	9	16.67%	3	33.33%	5	55.56%			1	11.11%
Daer Reservoir	8	8.33%	5	62.50%	3	37.50%				
Weston	4	0.72%	2	50.00%	1	25.00%	1	25.00%		
Semi-invasive										
Daer 84	1	2.38%					1	100.00%		
Daer 85	1	1.85%	1	100.00%						

Table 7-9: Numerical and percentage frequencies of type of retouch to chert and flint microliths by microlith thickness.

7.3.1.7 Size Dimensions

The mean length of microliths ranges from 14.84mm at Daer Reservoir to 12.89mm at Weston (Table 7-10; Figure 7.25). The standard deviation for Climpy is ±2.98mm which reflects a tight clustering of blanks chosen for modification. Figure 7.23 illustrates the higher standard deviations for Daer 84 (±3.67mm), Daer 85 (±3.55mm), Daer Reservoir (±4.53mm) and Weston (±3.89mm) arising out of the presence of a number of longer pieces. The modal length of microliths from Climpy, Daer 85 and Weston are constant at 11mm, with 10mm at Daer 84. This contrasts with a figure of 13mm for Daer Reservoir. There are common differences in the modes and STDEVs for the length of chert platform blade cores. The modal core length from Daer 84, Daer 85 and Weston fall within a parameter of 20-23mm with Daer Reservoir at 31mm (Table 10-6).

There is no substantial variation in the mean length dimensions for different types of microlith. For example, an analysis of chert scalene triangles determined that the variations of the mean length, when compared to the data from all microliths, range from +0.83mm at Daer 84 to +0.09m for Climpy.

The difference in the mean length of chert platform blades to microliths varies from 4.9mm at Daer 85, Daer 84 4.44mm and Climpy 0.84mm. The mean length of complete blades, microliths with a bulb of percussion and microliths are shown at Figure 7.26. Unlike Climpy, a clear progression in mean lengths is noted Daer 84 and Daer 85. This lends further weight to the interpretation that microliths were not manufactured at Climpy.

Climpy (n=23)	L mm	W mm	Loch Doon (n=2)	L mm	W mm
Maximum	19	6	Maximum	15	7
Minimum	11	3	Minimum	12	4
Average	14.83	4.7	Average	13.5	5.5
STDEV	2.98	0.63	STDEV	2.12	2.12
Mode	11	5	Mode	N/A	N/A
Daer 84 (n=42)	L mm	W mm	Powbrone (n=4)	L mm	W mm
Maximum	23	7	Maximum	17	7
Minimum	8	2	Minimum	13	4
Average	13.19	3.98	Average	13.25	5.25
STDEV	3.67	1.12	STDEV	2.87	1.5
Mode	10	4	Mode	13	4
Daer 85 (n=54)	L mm	W mm	Weston (n=558)	L mm	W mm
Maximum	24	10	Maximum	31	9
Minimum	9	2	Minimum	6	2
Average	13.83	4.02	Average	12.89	3.91
STDEV	3.55	1.25	STDEV	3.89	1.24
Mode	11	4	Mode	11	3
Daer Reservoir (n=99)	L mm	W mm			
Maximum	27	8			
Minimum	7	3			
Average	14.84	4.29			
STDEV	4.53	1.21			
Mode	13	4			

Table 7-10: Size dimensions of microliths.

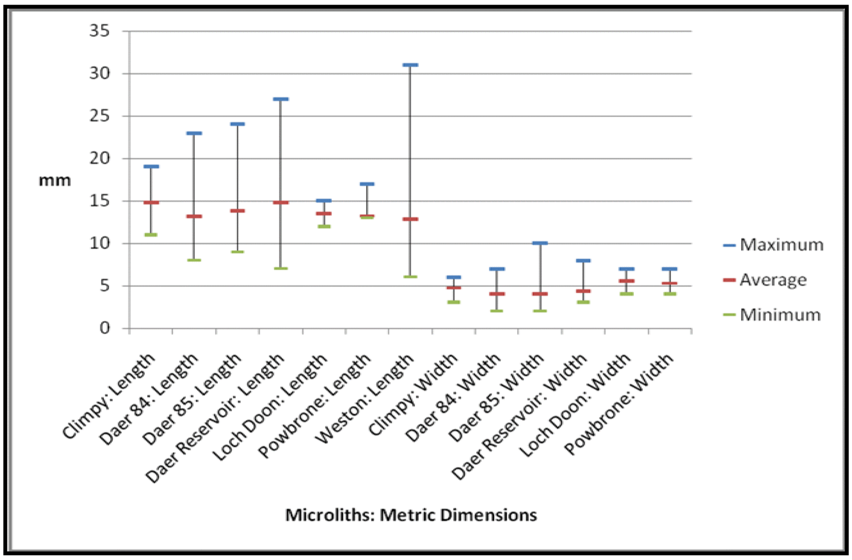

Figure 7.25: Metric data from the analysis of microliths.

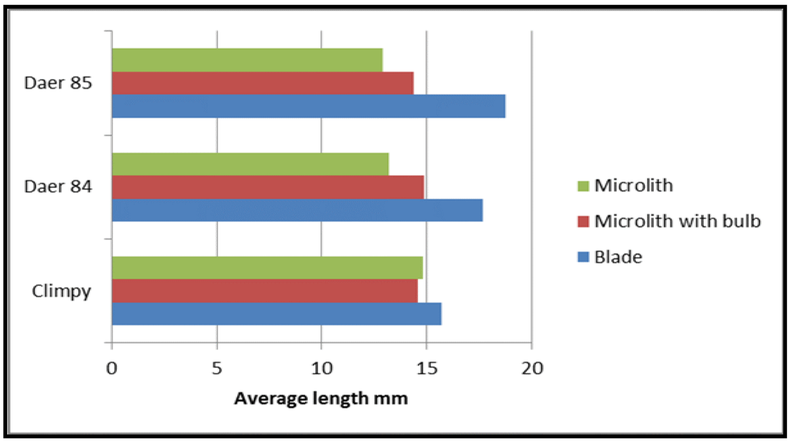

Figure 7.26: Average length of platform blades, microliths with a bulb of percussion and microliths.

7.3.1.8 Scalene triangles

Finlayson (2004, 224) specifically notes the close continuity in the form of microliths. For example, it is only the angularity of the scalene triangle which distinguishes it from the crescent. For the attribute analysis of microliths, any artefact presenting with an angular or sub-angular attribute has been classified as a scalene triangle. Crescents have only been classified as such where there is an uninterrupted crescental curve.

The pattern of the morphology of the shortest side to the scalene triangles has profound common differences to that noted in the assemblages from the SHMP (Finlay *et al*. 2000a, 576). Variations include convex and straight examples. The curvature for a number of the convex forms is moderately rounded and is distinguishable from crescents by a shallow sub-angular attribute. There are differences in the base morphology of scalene triangles. 14.29% present with a bulb of percussion. The most common attribute is the break snap at 50.96% with only 3.20% displaying burin scars. 21.32% of the artefacts have been backed on more than two sides.

7.3.1.9 Backed bladelets

92.82% of the backed bladelets have retouch to one side. The remainder of the artefacts have limited retouch to one other side. The retouched side profile varies between straight and irregular; those few backed bladelets with a shallow curved profile have been classified as irregular. A bulb of percussion is retained on 23.92% of backed bladelets. Break snaps dominate at 67.94% and burin scars are recorded on 4.31% of the artefacts.

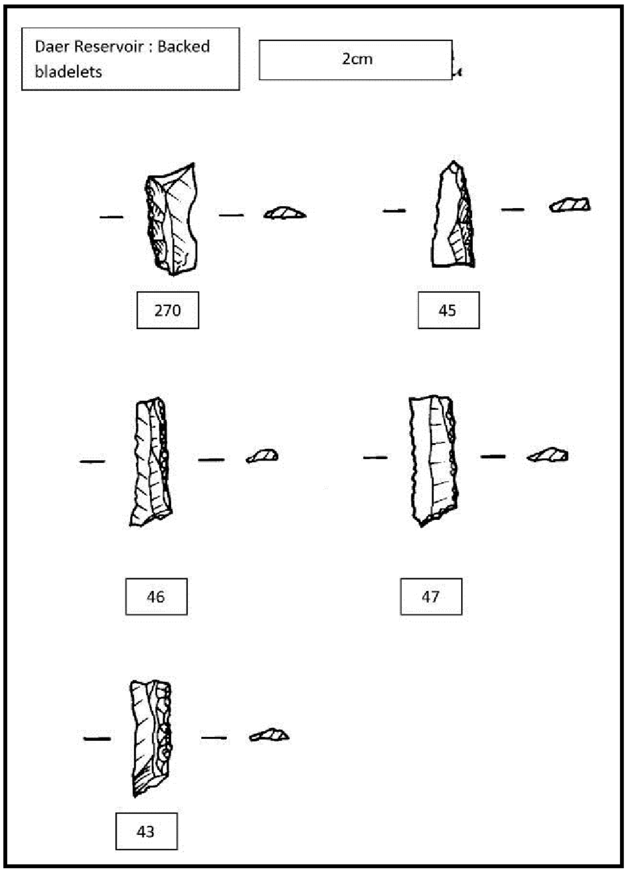

Figure 7.27: Backed bladelets from Daer Reservoir 3, other than (270) which is from Daer Reservoir 2.

7.3.1.10 Needle points

4.99% of microliths are needle points. They are present in all of the assemblages in varying degrees of percentage frequency apart from Loch Doon. 10.26% have retouch to more than two sides. Break snaps are the most common form of base morphology at 51.28%. The vestiges of a microburin scar are present on 2.56% of needle points, and 28.21% retain a bulb of percussion; angled retouch 17.95%.

7.3.1.11 Double backed bladelets

Double backed bladelets have been recovered from Daer 84, Daer 85, Daer Reservoir and Weston. These artefacts are distinguishable from broken needle points on the basis that they are generally fashioned on broader blanks, although there is one double backed bladelet which may be a broken needle point (cf. Figure 7.9).

The highest occurrence is at Daer 85 (16.67%) followed Daer 84 (7.14%). These two sites account for 12 of the 27 double backed bladelets. 11.11% have retouch to more than two sides. Break snaps dominate the base morphology profile at 62.96%; retention of a bulb of percussion 29.63%, and angled retouch at 7.41%. There are double backed bladelets presenting with *piquant-trièdre* attribute associated with the microburin technique.

7.3.1.12 Indeterminates

These microliths fall outwith the classification categories postulated by the SHMP. The extent of retouch is variable and irregular without any concord in form. There is no recognisable patterning to these artefacts across the sites.

7.3.1.13 Crescent

There are only five crescents in the assemblages; three from Weston and one each from Climpy and Daer 85. 40.00% have retouch to more than two sides, with 20.00% displaying a point attribute. All five of the pieces have a curved base morphology.

7.3.1.14 Leaf points

Leaf points are the least frequent of the microliths forms with three examples from Weston and one from Climpy, and all have a shallow irregular curvature. The principal retouched edge meets the unretouched to form a point. There are examples with retouch to more than one side, which is generally irregular and is not associated with the character of the point.

7.3.2 Microlith fragments

There are 227 microlith fragments. For each of the sites the numerical and percentage frequencies by type and raw material are shown at Table 7-11; percentage frequencies are illustrated at Figure 7.28. The results of the technological attribute analysis, which is based on Finlay's (2009) schema, are detailed at Table 7-12.

Backed bladelets are the principal form from Daer 85 and Daer 84, with scalene triangles most frequent at Climpy, Weston and Daer Reservoir, which replicates the patterning of microliths from these sites. The frequencies do vary which may reflect the relatively high incidences of indeterminate microlith fragments.

The percentage occurrence of the profile of microlith fragments is recorded at Table 7-11 and Figure 7.29. There are two distinct clusters; namely for medial and distal fragments which are the most frequent followed by medial fragments. Wide variations are seen in the prevalence of medial and distal fragments at Climpy and Daer 85 and distal fragments from Climpy. 16.74% of microlith fragments retain a bulb of percussion, comprising of proximal fragments and medial and proximal fragments; complete microliths 16.75%.

The lateralisation of retouch shows that modification to right dorsal lateral side and the left dorsal lateral side statistically equate. Breaks generally take the form of a snap/bending fracture producing with either a straight or angled character. They are most frequently associated with manufacturing with the break emanating from the retouched edge. 13.22% of microliths appear to have been fragmented through use. 14.54% of the artefacts have edge damage to the unretouched lateral edge, with 2.64% showing inverse edge damage.

	Total	%	Chert	%	Flint	%	Chalcedony	%	Blue Stone'	%
Climpy										
Backed bladelet	1	10.00%	1	10.00%						
Scalene triangle	7	70.00%	7	70.00%						
Indeterminate	2	20.00%	2	20.00%						
	10	100.00%	10	100.00%						
Daer 84										
Backed bladelet	6	42.86%	5	35.72%	1	7.14%				
Double backed bladelet	3	21.43%	2	14.29%	1	7.14%				
Scalene triangle	1	7.14%	1	7.14%						
Indeterminate	4	28.57%	4	28.57%						
	14	100.00%	12	85.72%	2	14.28%				
Daer 85										
Backed bladelet	8	72.73%	7	63.64%	1	9.09%				
Indeterminate	3	27.27%	2	18.18%	1	9.09%				
	11	100.00%	9	81.82%	2	18.18%				
Daer Reservoir										
Backed bladelet	7	20.59%			6	17.65%			1	2.94%
Double backed bladelet	3	8.82%	1	2.94%	2	5.88%				
Scalene triangle	8	23.53%	1	2.94%	5	14.71%	2	5.88%		
Needle point	1	2.94%	1	2.94%						
Indeterminate	15	44.12%	4	11.76%	10	29.42%	1	2.94%		
	34	100.00%	7	20.58%	23	67.66%	3	8.82%	1	2.94%
Powbrone										
Backed bladelet	3	100.00%	2	66.67%	1	33.33%				
	3	100.00%	2	66.67%	1	33.33%				
Weston										
Backed bladelet	35	22.58%	33	21.29%	2	1.29%				
Double backed bladelet	5	3.22%	4	2.58%	1	0.64%				
Scalene triangle	69	44.52%	46	29.68%	22	14.19%	1	0.65%		
Needle point	6	3.87%	3	1.94%	3	1.93%				
Indeterminate	40	25.81%	31	20.00%	8	5.16%	1	0.65%		
	155	100.00%	117	75.49%	36	23.21%	2	1.30%		

Table 7-11: Numerical and percentage frequency of microlith fragments by type and raw material.

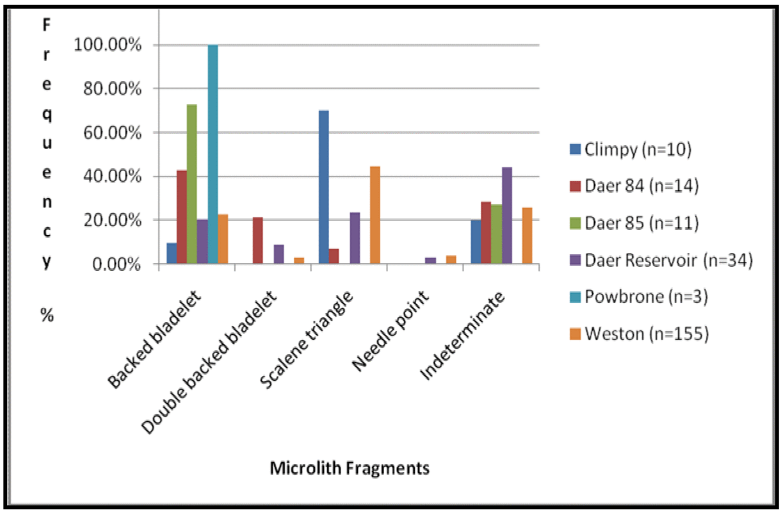

Figure 7.28: Numerical and percentage frequency of microlith fragments by type and raw material.

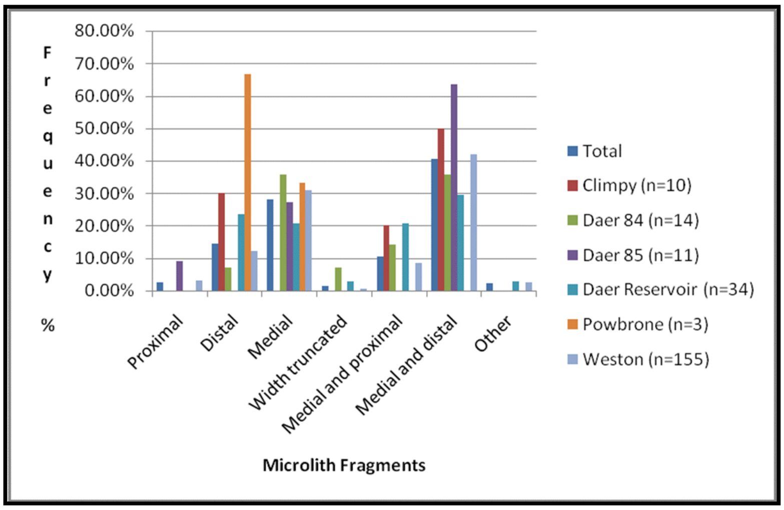

Figure 7.29: Percentage frequency of fragment patterning for microlith fragments.

	Climpy	Daer 84	Daer 85	Daer Reservoir	Powbrone	Weston
Fragment type						
Indeterminate				1		4
Proximal fragment			8			5
Distal fragment	3	1	1	8		19
Medial fragment		5	1	7	1	48
Width truncated		1		1		1
Medial and proximal	2	2		7	1	13
Medial and distal	5	5	1	10	1	65
	10	14	11	34	3	155
Base Morphology						
Bulb present	2	10	1	4	1	17
Break snap	8	4	10	28	2	125
Burin snap				1		2
Retouch (angled/curved)				1		11
	10	14	11	34	3	155
No. Of retouched sides						
1	5	8	10	19	3	76
2	5	6	1	15		69
3						10
4						
	10	14	11	34	3	155
Location of retouch						
Indeterminate				8		30
Right dorsal lateral side	3	6	6	10	1	64
Left dorsal lateral side	7	5	5	16	2	61
Both lateral sides		3				
	10	14	11	34	3	155
Type hierarchy						
Backed one side	3	8	10	23	3	56
Backed one side to point				5		20
Backed both sides	2	3	1	4		7
2 edges, angled/curved	3	2				62
2 edges, straight		1		1		3
2 edges to point	2			1		7
	10	14	11	34	3	155
No. of breaks						
1	10	13	10	26	2	115
2		1	1	8	1	40
	10	14	11	34	3	155
EDIMLE						
Yes				1		
No	10	14	11	33	3	155
	10	14	11	34	3	155

	Climpy	Daer 84	Daer 85	Daer Reservoir	Powbrone	Weston
Break location						
Indeterminate				1		5
Proximal	3	1	8	1	1	63
Distal	5	4		13	1	33
Lateral retouched	2	8		7		14
Lateral unretouched				3		1
Combination		1	3	9	1	39
	10	14	11	34	3	155
Break description						
Burnt	1					
Snap/bending fracture	8	12	11	31	3	149
Burin facet				1		2
Notch	1			1		2
Other		2		1		2
	10	14	11	34	3	155
Type of break						
Straight	3	6	9	22	3	71
Angled	5	4	2	6		61
Burnt	1					
Irregular		1		1		3
Other		2				
Combination	1	1		5		20
	10	14	11	34	3	155
Direction of break						
Retouched edge	8	13	10	32	3	135
Unretouched edge	2			1		9
Dorsal						1
Ventral						1
Proximal end		1				
Indeterminate			1	1		9
	10	14	11	34	3	155
Reason for break						
Indeterminate		4		1		23
Burning						1
Post-depositional				1		
Manufacture	10	10	8	25	3	131
Use			3	7		
	10	14	11	34	3	155
EDMLE						
Yes		3	3	8		
No	10	11	8	26	3	155
	10	14	11	34	3	155

Table 7-12: Attribute analysis of microlith fragments.

7.3.3 Truncations

There are 44 truncations, of which 34 are from Weston, with other examples from Daer 84, Daer 85 and Daer Reservoir. The dominant form is the oblique truncation which has only been recovered from Weston and Powbrone, apart from the artefact recovered from outwith the main scatter area at Climpy.

Notch and snaps and *lamelle à cran* also feature in the assemblage from Weston. Microburins are noted from Daer 84, Daer 85, Daer Reservoir and Weston. One of the microburins from Site 1, Daer Reservoir is ‘blue stone’, the other five are flint.

7.3.3.1 Oblique truncations

20 of the 22 oblique truncations are from Weston (chert 60.00%; flint 40.00%). The analysis of the attributes and the size dimensions of oblique truncations are shown at Table 7-13.

Generally, the oblique truncations have complete retouch to the truncated end, which is most frequently the proximal end following the removal of the bulb of percussion. There is no pattern regarding the lateralisation for the shortest side of the artefact, which may infer that more than one routine was involved in the manufacture of these truncations. There are no profound variations in the common differences for flint or chert oblique truncations.

Weston (n=20)	Total	%		Total	%
Truncation type			**Bulb of percussion**		
Retouched	20	100.00%	Absent	15	75.00%
Burin			Present	5	25.00%
Extent of retouch			**Notch**		
None			Absent	18	90.00%
Partial	1	5.00%	On part of truncation	2	10.00%
Complete	19	95.00%	Below, separate		
End truncated			**Backed**		
Indeterminate	3	15.00%	Yes		
Proximal	12	60.00%	No	20	100.00%
Distal	5	25.00%			
			Any other retouch		
Side			Yes		
Indeterminate	6	30.00%	No	20	100.00%
Left	7	35.00%			
Right	7	35.00%	**Opposable Burin blow**		
			No	20	100.00%

Size Dimensions	L mm	W mm	Th mm	Blades	L mm	W mm	Th mm
Maximum	23	8	2	Maximum	36	14	4
Minimum	9	3	1	Minimum	9	2	1
Average	14.65	5.15	1.35	Average	19.88	6.44	2.14
STDEV	4.28	1.39	0.49	STDEV	8	3.21	1.1
Mode	11	5	1	Mode	17	3	1

Table 7-13: Attribute analysis and size dimensions of oblique truncations from Weston, and size dimensions of 43 chert and flint blades deemed complete for measurement.

7.3.3.2 Notch and snap

Table 7-14 sets out the results of the attribute analysis for the eight notch and snap truncations from Weston (chert 62.50%; flint 37.50%). The low numerically frequency makes it impossible to discern, with any degree of accuracy, any patterning in the manufacture of these truncations. One flint notch and snap truncation (catalogue number 905) has the notch situated on the left side from the proximal to the upper medial. The notch has a length of 9mm (range 4-9mm) and a concave depth of 2mm (range 1-2mm). Immediately below the notch, there is direct scalar abrupt retouch from the upper mesial to the distal.

Weston (n=8)	**Total**	**%**		**Total**	**%**
Truncation type			**Bulb of percussion**		
Retouched	8	100.00%	Absent	6	75.00%
Burin			Present	2	25.00%
Extent of retouch			**Notch**		
None			Absent		
Partial	5	62.50%	On part of truncation	5	62.50%
Complete	3	37.50%	Below, separate	3	37.50%
End truncated			**Backed**		
Indeterminate	3	37.50%	Yes	1	12.50%
Proximal	3	37.50%	No	7	87.50%
Distal	2	25.00%			
			Any other retouch		
Side			Yes		
Indeterminate	2	25.00%	No	8	100.00%
Left	4	50.00%			
Right	2	35.00%	**Opposable Burin blow**		
			No	8	100.00%

Table 7-14: Attribute analysis of notch and snap truncations.

7.3.3.3 Microburins

The populations of microburins are generally low, apart from Daer Reservoir. There are greater incidences for the removal of the proximal end using the microburin technique, with the notch favouring a right lateralisation (Table 7-15).

The presence of microburins at Daer 84, Daer 85, Daer Reservoir and Weston provides strong evidence for the manufacture of microliths at these sites. It has been established that the microliths at Climpy were associated with re-tooling (Innes *et al.* forthcoming).

Table 7-16 sets outs the data from the metric analysis of microburins. A comparison with the data from the SHMP (Finlay *et al.* 2000a, 580) shows common differences between Daer Reservoir and Daer 85 to Staosnaig 14; Weston to Coulererach and Bolsay Farm, and Daer 84 to Aoradh. The types of microliths must also be considered. The most common forms from Weston are scalene triangles followed by backed bladelets which is the pattern mirrored at Coulererach (Mithen and Finlay 2000a, 225) and Bolsay Farm (Mithen *et al.* 2000, 284). The primacy of backed bladelets over scalene triangles is noted at Daer 84 and at Aoradh (Mithen *et al.* 2000, 237). This pattern is also seen at Staosnaig 14 [ratio 3:1] (Mithen and Finlay 2000, 400), although backed bladelets have a lesser frequency than scalene triangles at Daer Reservoir (ratio 1: 0.78) and Daer 85 (ratio1:0.53). The disparity is not explained by the mean lengths of microliths (cf. Table 7-10 and Mithen and Finlay 2000, Table 5.20). It is possible that a greater number of backed bladelets were either used, or manufactured and taken away Daer Reservoir and Daer 85 or the relative scarcity represents bias due to a conflation of different events.

The absence of microburins may suggest that microliths were not manufactured at Climpy, Loch Doon, Powbrone and Starr 1. Experimental work undertaken by Finlay (2003, 174) on the manufacture of scalene triangle microliths using a microburin technique determined that 20.00% of cases there was no identifiable microburin. Accordingly, there may be evidence of microlith manufacture at these sites in the form of microburins but without the necessary attributes to classify them as such.

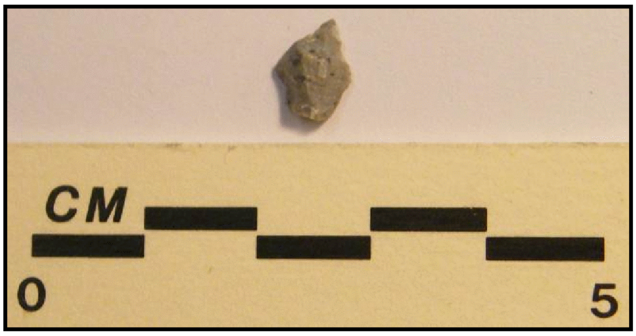

Figure 7.30: Blue stone microburin (10) from Daer Reservoir 1.

	Daer 84		Daer 85		Daer Reservoir		Weston	
	Total	%	Total	%	Total	%	Total	%
Truncation type								
Retouched	1	100.00%	3	100.00%	6	100.00%	4	100.00%
Burin								
Extent of retouch								
None								
Partial	1	100.00%	3	100.00%	6	100.00%	4	100.00%
Complete								
End truncated								
Indeterminate					2	33.33%		
Proximal			3	100.00%	4	66.67%	2	50.00%
Distal	1	100.00%					2	50.00%
Side								
Indeterminate					2	33.67%		
Left							3	75.00%
Right	1	100.00%	3	100.00%	4	66.67%	1	25.00%
Bulb of percussion								
Absent			3	100.00%	6	100.00%	2	50.00%
Present	1	100.00%					2	50.00%
Notch								
Absent								
On part of truncation	1	100.00%	3	100.00%	6	100.00%	4	100.00%

Table 7-15: Attribute analysis of microburins.

Daer 84 (n=1)				**Daer Reservoir (n=6)**			
	L mm	W mm	Th mm		L mm	W mm	Th mm
Maximum	10	5	1	Maximum	14	12	2
Minimum	10	5	1	Minimum	6	4	1
Average	10	5	1	Average	8.83	7	1.83
STDEV				STDEV	2.79	2.83	0.41
Mode	10	5	1	Mode			2
Daer 85 (n=3)				**Weston (n=4)**			
	L mm	W mm	Th mm		L mm	W mm	Th mm
Maximum	16	9	2	Maximum	16	9	2
Minimum	13	5	1	Minimum	13	5	1
Average	7.67	6.67	2.33	Average	14.5	6.5	1.75
STDEV	1.53	2.52	1.15	STDEV	1.53	2.52	1.15
Mode			3	Mode		6	2

Table 7-16: Metric dimensions for microburins.

7.3.3.4 *Lamelle à Cran*

Two chert *lamelle à cran* were recovered from Weston, with the bulb of percussion retained on both artefacts. Direct abrupt scalar retouch to the right hand side creating a concave edge is common to both pieces. The length range of 13-29mm falls within the range noted for *lamelle à cran* at Bolsay Farm (Finlay *et al*. 2000a, 580); width is marginally greater at 7-18mm against 5-14mm. The width of the retouched section at 2-4mm also falls within the parameters at Bolsay Farm of 2-5mm.

7.3.4 Scrapers

Apart from Climpy, there is a wide variety of scrapers across the sites (Table 7-17; Figure 7-32). The diversity of scraper forms is shown at Figure 7.33. The point has been made that scrapers are common artefacts in the assemblages of later prehistory [Finlay *et al*. 2000a, 583] (Section 5.3.5). It is possible that some of the scrapers from Loch Doon, Powbrone and Weston may relate to either the Neolithic or Bronze Age periods. Bronze Age artefacts have been recorded at Loch Doon and Powbrone and Neolithic pottery has been recovered from Weston. 12 scrapers were recovered from Starr 1; 50.00% each of flint and chert (Finlayson 1989, 167). No analysis by type is available.

Scrapers are generally fashioned from flakes. Apart from Powbrone, the artefacts displaying bipolar attributes are relatively few, although present at all sites. The use of the bipolar technique may signify different routines resulting from different events.

Figure 7.31: Chert and flint scrapers from Powbrone.

The variant convex forms are most common. Angled and sub-angled scrapers are represented at all sites other than Climpy. These forms are typically Mesolithic and are the most numerous form found at Kinloch, Rùm (Wickham-Jones and McCartan 1990, 91). There are higher incidences of straight scrapers at Loch Doon (23.81%) and Daer Reservoir (15.22%) with lower frequencies at Weston (11.11%), Daer 85 (9.09%), Daer 84 (7.14%) and Powbrone (4.76%).

The ratios of convex scrapers to thick convex scrapers fall into two broad categories (Table 7-18). This incorporates wide convex scrapers. Firstly, the ratios for Daer Reservoir and Loch Doon are 6.67:1 and 6.00:1, respectively. Secondly, the lowest ratios are witnessed at Daer 85 (2.00:1), Daer 84 (2.66:1) and Weston (2.88:1). The evidence from Powbrone contrasts with these parameter groupings with a ratio of 4.00:1. The thickness of the artefact will impact upon the morphology of the scraping edge (Finlay *et al*. 2000a, 583). The variation in the composition of the convex sub-assemblage between thin and thick forms may indicate task differentiation. The corresponding ratios from the *SHMP* fall within the secondary grouping ranging from 2.50:1 for Rockside (after Mithen *et al*. 2000, 214) to 1:1 for Bolsay Farm (after Mithen *et al*. 2000, 287).

	Climpy	Daer 84	Daer 85	Daer Reservoir	Loch Doon	Powbrone	Weston
Short convex		5	4	18	12	3	24
Short convex flared		2	1	1		1	2
Short thick convex		1	5	3		1	8
Short thick convex flared		2			2		1
Concave	1						
Denticulate				3	1	2	1
Long convex		1	1	1			
Angled		1	2	1		3	3
Sub-angled		5	2	8	1	4	9
Straight		2	3	7	5	1	6
Wide convex			4				
Irregular			1	4			
Fragments	1	9	10			6	
	2	28	33	46	21	21	54

Table 7-17: Numerical frequency of scrapers by type.

	Convex	Thick convex	Ratio
Daer 84	28.57%	10.71%	2.66:1
Daer 85	30.30%	15.15%	2.00:1
Daer Reservoir	43.48%	6.52%	6.67:1
Loch Doon	57.14%	9.52%	6.00:1
Powbrone	19.05%	4.76%	4.00:1
Weston	48.15%	16.67%	2.88:1

Table 7-18: Percentage frequency of convex and thick convex scrapers, and ratio of convex scrapers to thick convex scrapers.

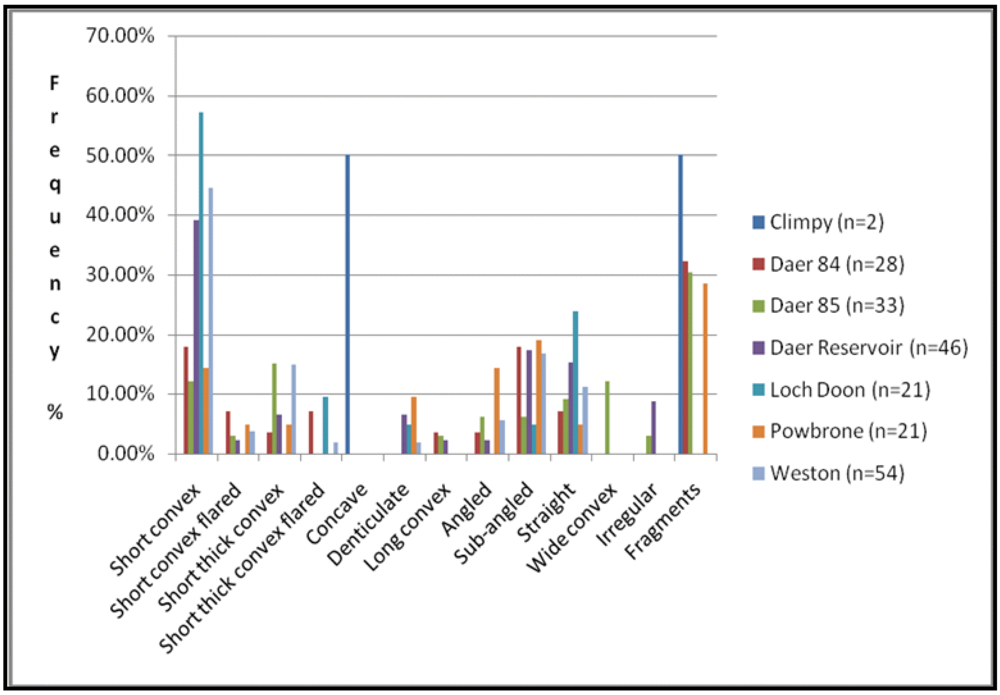

Figure 7.32: Percentage frequency of scrapers by type.

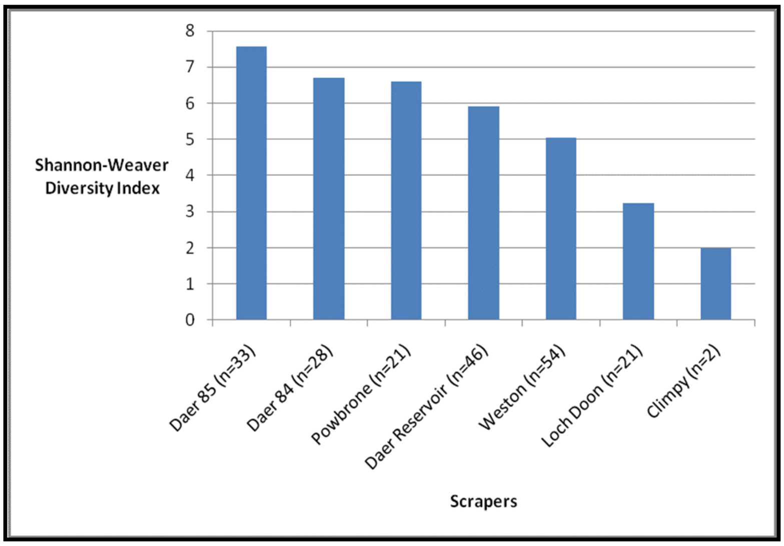

Figure 7.33: Diversity of types of scraper.

7.3.5 Other forms of retouched pieces

Abruptly backed, thin backed, points and awls are rare (Table 7-3). Denticulates are recorded at each of the seven sites in this study. Numerically they are most common at Climpy, Daer 84, Loch Doon and Weston. Notches are noted at all sites apart from Climpy and Loch Doon, with the highest numerical incidence at Daer 84, Weston and Daer 85 (Figure 7.34).

The miscellaneous retouch to the edge of artefacts is generally poorly formed and rudimentary. The character of these pieces differs from those from later prehistoric periods; a point made by Finlay *et al*. (2000a, 586) when analysing the assemblages from the *SHMP*.

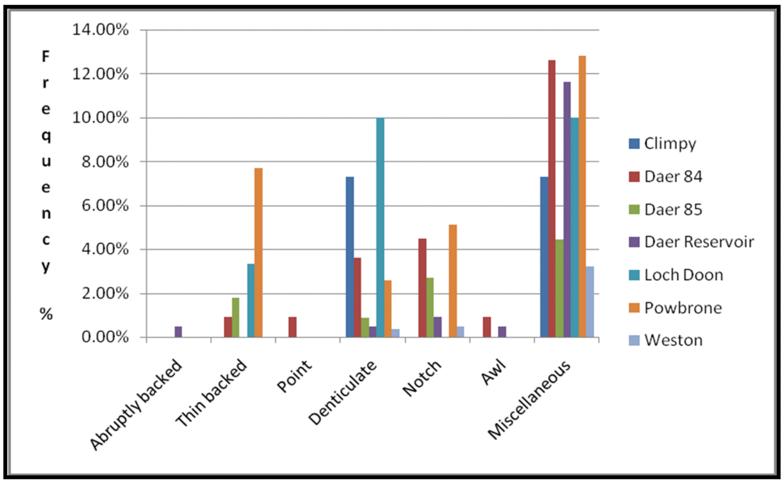

Figure 7.34: Percentage frequency of other retouched artefacts within secondary modification classification.

7.3.6 Edge Damage

The numerical frequencies of retouched artefacts with edge damage are shown at Tables 6-19. The factors relating to edge damage at Section 6.6 are also relevant here.

Three artefacts with edge damage were recovered from Climpy. One of the two artefacts with miscellaneous retouch has post-depositional edge damage, and the other has edge damage, although it cannot be categorically attributed to use. The concave side scraper has use-induced edge damage.

31 artefacts with secondary modification from Daer 84 have edge damage, with 42 from Daer 85. 21.42% of the microliths from Daer 84 have edge damage; Daer 85 27.77%. This compares to 30.77% of microliths from Smittons (Finlayson 1989, 159), and 40.74% from Starr 1 (*ibid*, 176) with evidence for edge damage through use-wear traces. It is not possible to categorically attribute edge damage to the microliths from Daer 84 and Daer 85 through use by macroscopic examination. None of the artefacts may be said to have post-depositional damage.

The majority of scrapers from Daer 85 (52.39%) have evidence of edge damage; a percentage frequency which is more than twice the incidence at Daer 84 at 25.80%. The majority of these artefacts appear to have been used. A number of the other tool forms also present with edge damage.

Six retouched artefacts from Loch Doon have edge damage associated with use, comprising of one scraper, one thin-backed, two denticulates and two pieces with miscellaneous retouch. Eight of the 12 blanks are blades with flakes as the remainder. Only two of the blanks are irregular.

There are 19 artefacts with edge damage from Powbrone. It is only the scrapers where edge damage with any degree of comfort can be ascertained as use induced. A similar conclusion may be drawn from the 62 artefacts from Weston with retouch which also have edge damage, which represent 7.43% of the modified pieces analysed. 83.87% are scrapers; miscellaneous retouch 9.67%; microliths 4.83% and one denticulate.

Scrapers are the most common class of artefact with scraper edge damage which may possibly be attributed to use. Trimming, as defined at Section 6.6, is recorded on 44.80% of microliths, including a proportion which also present with a notch. Again it is difficult to determine if the notch represents use-wear. The trimming of an unretouched edge to microliths distinguishes Daer Reservoir from the other assemblages. This may suggest the use of irregular blanks for microlith production.

	Climpy	Daer 84	Daer 85	Daer Reservoir	Loch Doon	Powbrone	Weston
Modified w/edge damage							
Microliths		9	15	33			3
Microlith fragments		3	1	8			
Scrapers	1	8	22	43	1	14	52
Thin backed		1			1	2	
Denticulate		3			2		1
Notch		1	1			1	
Miscellaneous	2	5	3	5	2	2	6
Awl		1					
	3	31	42	89	6	19	62

Table 7-19: Numerical frequency of retouched artefacts with edge damage.

7.3.7 Discussion

Generally, chert is the most common form of raw material utilised for pieces with secondary modification, although the presence of flint in varying percentage frequencies may, following Finlayson (1989), be either time transgressive and indicate zones of earlier activities conflated with later events during the Mesolithic period, or an exchange commodity.

Based on the evidence of microburins, in contrast to Climpy, it is probable that microliths were manufactured at Daer 84, Daer 85, Daer Reservoir and Weston. The presence of notch and snap and *lamelle à cran* truncations and oblique truncations sets Weston apart from the other inland assemblages, although two oblique truncations were recovered from Powbrone (Table 7-3). Microliths and microlith fragments dominate the excavated assemblages. The use of trimming as a shaping routine for the microliths from Daer Reservoir is not seen at the other assemblages, although trimming is noted on blanks from Weston.

Finlayson (1989; 1990; 1990a, 3) has demonstrated through use-wear analysis on microliths from Starr 1, Starr 2 and Smittons that the upland occupations in West Central Scotland were not exclusively for hunting forays. Eight microliths and microlith fragments from Smittons have use traces. Six, comprising of two backed pieces, two scalene triangles, one crescent and one rod, have been interpreted as having been used as projectiles with two indeterminate. Finlayson

(1989, 161) suggests there is evidence from Smittons to suggest that a wide range of other tasks were undertaken.

It was possible to determine the motion for 11 of the microliths from Starr 1 with use traces and of those seven could be ascribed function. An oblique truncation, scalene triangle and the trapeze were associated with use as a saw. A crescent was used for cutting; an indeterminate fragment for manufacturing a groove, and a scalene triangle for the shaving of material. Scalene triangles and backed pieces were also employed as piercers. There is less evidence from Starr 1 for hunting related activities. It is suggested that location of the Starr sites and the proximity to Loch Doon may have provided a focus on fishing and the foraging of plant resources (Finlayson 1989, 180; 1990a, 3).

A scalene triangle dominated assemblage from Gleann Mor, Islay has evidence for both projectile and non-projectile use (Finlayson 1989, 190). What arises out of this analysis is that microliths by type cannot be associated with any given singular function (e.g. David 1998, 201). However, Finlayson (1989, 180) makes the point that if all of the microliths are considered then the assemblages compose of different types. The variation in the use-wear patterns for Starr and Smittons may be an oversimplification as a result of the sample size which is small (Finlayson 1989, 193).

At Smittons backed bladelets account for 44.44% of microliths and microlith fragments; scalene triangles 25.93%. The reverse situation is noted at Starr 1 and Starr 2 with scalene triangles at 38.46% and backed bladelets at 20.51%. Finlayson is offering the premise that it is possible that assemblages dominated by backed bladelets may be associated with hunting and other tasks, and scalene triangles are more likely to be connected with other tasks. 29.05% of the microliths from Gleann Mor are scalene triangles; backed and double backed bladelets 7.03%. 120 (36.70%) out of 327 microliths were subject to detailed examination of which 46 have use traces. Attributes associated with projectiles are noted on 13.04%; non-projectile 58.70% (Mithen and Finlayson 2000, 197-200). The more multifaceted evidence of microlithic use trace patterning from Gleann Mor may override the demarcations noted at Starr and Smittons (Finlayson 1989, 193). The occupations at Starr have been interpreted as small task camps in contrast to Smittons which incorporated a wider range of activities

(Finlayson 1989, 201). The issues arising out of the breakdown of microliths by type from Smittons, Starr 1 and Gleann Mor and how these arbitrary groupings based on use-wear analysis may provide insight to events at the inland sites in this study are discussed in chapter 8.

7.4 Summary

The diversity of raw materials indicates intra-site and inter-site variation suggesting different episodes of activity and different groups of hunter-gatherers. These variations are also noted in the profiles of microliths, scrapers and other tool forms, although biases in recovery cannot be entirely disregarded.

The secondary technologies give further insight into the connections and disconnections in the *chaîne opératoire*, and once again affirm the continuity of technological practice. It seems most likely that the inland occupation of West Central Scotland may be represented by a suite of sites of task differentiation.

The nature of the occupations, the potential for defining a relative chronology based on variations in raw materials and considering issues relating to the recognition of social boundaries will be explored in the next chapter.

Chapter 8: Discussing repetition, difference as variation and becoming

8.1 Introduction

The theoretical structure to the thesis is crucial and its importance should not be underplayed. I shall argue that the *chaîne opératoire* must be understood as embedded in the Deleuzian concepts of repetition, difference and becoming enacted within the social dimension. These enhanced constructs go beyond the recognition of variation, and give it meaning as the product of repetition in the transformations of becoming. Variation as becoming is inseparable from the notion of technology as people, where the conflated moments within the lithic assemblage may be recognised as fragments of the hunter-gatherer across the landscapes of West Central Scotland. Understanding is drawn from the nexus of the enriched concepts of repetition, difference, becoming augmented by those constructs espoused in chapter 3 from psychology, analytical philosophy, anthropology and archaeology.

This chapter considers a number of issues arising out of the typological and technological analysis of the lithic collections/assemblages from those coastal and inland sites highlighted in Chapter 4, and the evidence for the possibility of sedentary occupation at Girvan during the Late Mesolithic period. Reference is also made to the lithic assemblages from the islands of the Firth of Clyde. There is little known of Mesolithic events on the islands of the Clyde other than on Arran, which has been a focus of a number of research and rescue archaeology projects since the late 1970s (cf. Section 2.4.3.1). The data from Arran is important in order to widen the framework of investigation to examine and explore ideas of regionality and intra-regional variation within West Central Scotland. The assemblage from Gleann Mor, Islay (Mithen and Finlayson 2000) and the *SHMP* (Mithen 2000) generally feature for comparison.

Firstly, it is recognised that there are relatively few radiocarbon dates for the Mesolithic period in research area. The dating evidence is explored in conjunction with the evidence from other regional studies in Scotland to offer a tentative chronology of activity across the region. Secondly, the diversity in the different types of raw materials is considered as potential signifiers of intra-regional, inter-site and intra-site variation. Ethnographic perspectives and concepts of materiality and personhood are used to offer an interpretive, symbolic and cosmological understanding of raw materials during the Late Mesolithic period. Thirdly, the common differences and variations in technological practice manifest in the collections/assemblages are examined. Fourthly, the notions of the continuity of technological practice as being, identities and group identities, and the importance of technology in giving meaning and understanding to the landscape as an embodied taskscape are explored.

The evidence for sedentary occupation at Littlehill Bridge, Girvan as variation and the nature of the coastal occupations is presented with a complementary analogy with Tierra del Fuego. The rationale for this is drawn from two sources. Firstly, Spikins (2002, 63) suggests that the people of Tierra del Fuego lived in an environment broadly similar to that of Britain during the Mesolithic period. Secondly Mithen (2000a, 24), referencing the research undertaken by Patricia Woodman (1997), goes further suggesting that in addition to the environmental perspectives, technological development and subsistence practices indicate the efficacy for Tierra del Fuego as an appropriate correlation for the Scottish Mesolithic. The analogy also directs attention to the potentiality of different hunter-gatherer groups who chose to either occupy the coastal margins, or adopt an inland emphasis.

The concept of social boundaries and the nature of inland activities are explored. The evidence from Daer Reservoir is contrasted with the inland sites Waun Fignen Felen, South Wales (Barton *et al.* 1995). Finally, a regional profile of West Central Scotland is offered as a composite of common differences and intra-regional, inter-site and intra-site variation.

It is important to bear in mind the nature of the resource. The collections and assemblages represent palimpsests of events potentially conflating activities over millennia. The narrative of variation may, therefore, not be contemporaneous but indicate different temporal episodes by different hunter-gatherer groups in the taskscapes of West Central Scotland. While care has been taken to limit bias in the artefacts chosen for analysis, there is the unavoidable and inherent aggregation of the bias of collection, excavation and sampling strategies (cf. Chapter 4).

8.2 Chronology

Generally there is only one or occasionally two radiocarbon dates from sites (Table 8-1), apart from a suite of dates from the multi-period site at Warehouse 37, Girvan (cf. Becket *et al*. forthcoming). There are no radiocarbon dates associated with either the coastal collections from Ballantrae, or the collections from Loch Doon and Powbrone or the assemblage from Climpy. The dates indicate the first known events, and do not present us with evidence for an initial Mesolithic presence in West Central Scotland.

The nature of the palimpsest means that the paucity of radiocarbon dates presents real difficulties in determining the chronology of activities at a site level of enquiry. It is, however, possible to tentatively offer a chronology of events at an intra-regional scale.

8.2.1 Coastal

Mesolithic events at Girvan are known to range from the mid-5th millennium BCE to the late-8th millennium BCE. From the limited evidence available, activities tend to cluster in the Late Mesolithic period from the mid-5th millennium BCE to the early-7th millennium BCE, which is in keeping with the profile of the assemblages and collections from Girvan. The common differences in the profile of the Girvan collections/assemblages to the Ballantrae collections suggest events at Ballantrae are principally similarly focused on the Late Mesolithic period.

8.2.2 Inland

As previously stated (cf. Section 2.1.2) there are issues with the efficacy of the radiocarbon date from Daer Reservoir 1, and there are similar reservations with the date from Daer 85 (T. Ward pers. comm.). The dates from Starr, Loch Doon indicates events in the late-7th millennium BCE and the early-5th millennium BCE.

The nearby site of Smittons provides evidence for activities dated to the early-5th millennium BCE. Sites in the Daer Valley signify activity from the late-7th millennium BCE to the early-5th millennium BCE. Radiocarbon dates from South Lanarkshire outwith the research transect highlights events from mid-7th millennium BCE to the early-5th millennium BCE. The dating evidence from these inland sites again suggests events throughout the Late Mesolithic, which is analogous with the profile of the assemblages.

Site Coastal	Laboratory Date	Lab reference	Cal BCE (1δ)	Reference
Warehouse 37, Girvan	8800±30BP	SUERC-24465	7960-7790	Becket *et al.* forthcoming
Littlehill Bridge, Girvan	7350±60BP	Beta-108701	6245-6020	MacGregor and Donnelly 2001, 11
Grant's HQ, Girvan	7020±35BP	SUERC-2908	5990-5800	Banks *et al.* 2008
Gallow Hill, Girvan	5835±45BP	GU-9806	4780-4610	Donnelly and MacGregor 2005, 62
Warehouse 37, Girvan	5785±35BP	SUERC-24475	4700-4590	Becket *et al.* forthcoming
Inland	**Laboratory Date**	**Lab reference**	**Cal BCE (1δ)**	**Reference**
Daer Reservoir 1	9075±80BP	AA-30354	8545-7981	Ward 1998
Daer Reservoir 2	8055±75BP	AA-30355	7287-6695	Ward 1998
Starr	8000±100BP	OxA-1598	7300-6600	Edwards 1996, 118
Weston	7820±40BP	SUERC-6467	6775-6529	Ward 2005; 2006
Biggar Common	6300±130BP	GU-2987	5550-4850	Johnston 1997, 240-243
Smittons	6280±80BP	OxA-1595	5470-4990	Morrison and Bonsall 1989, 140
Starr1	6230±80BP	OxA-1596	5370-4950	Edwards 1996, 118
Weston	6035±40BP	SUERC-3562	5043-4808	Ward 2005; 2006
Biggar Common	6080±80BP	GU-2988	5230-4800	Johnston 1997, 240-243
Smittons	5470±80BP	OxA-1594	4460-4040	Morrison and Bonsall 1989, 140
Daer Reservoir 3	5355±45BP	AA-43004	4326-4047	Ward 2001
Daer 84	5390±35BP	SUERC-6829	4338-4071	Ward 2005
Broughton Village: Chert quarry	5220±35	Not referenced	4226-3961	Biggar Archaeology Group 2010
Daer 85	4930±35BP	SUERC-6463	3779-3647	Ward 2005

Table 8-1: Radiocarbon dates. Dates have been calibrated using either OxCal 2.81, or OxCal 3.5 or OxCal 4.1 (Ashmore 2004, 96; Bronk Ramsey 1995; 2000; 2011).

8.2.3 Comparative chronology

A comparison with the radiocarbon dates from the Inner Sound of Skye (Ashmore and Wickham-Jones 2007) shows that coastal sites are generally earlier than inland sites (Figure 8.1). This is further evidenced by the radiocarbon dates from East Barns of 8280-7970BCE [8985±70 AA-54960] (Gooder 2007, 53) and Cramond of 8630-8290BCE [9250±60 OxA-10180] (Lawson 2001, 124). An earlier date to East Barns has recently been reported from Creit Dhu, Isle of Mull at 8310-8250BCE [9080±40BP Beta-288421] (Wicks and Mithen 2011, 9).

Two of three radiocarbon dates from the inland site of Auchareoch, Arran at 165m OD [7350-6650BCE (8060±BP OxA-1601); 7050-6500BCE (7870±90BP OxA-1600)] (Affleck *et al.* 1988, 59) broadly correlate to the dates from Daer Reservoir 2 and Starr, respectively. The third date from Auchareaoch [6380-5990BCE (7300±90BP OxA-1599)] (*ibid*) sits between the earlier of the dates from Weston and Biggar Common. The recent radiocarbon dates from The Carrick, Loch Lomondside (MacGregor forthcoming) have produced evidence for earlier inland activities. The earliest date (8230-7960BCE [SUERC-14309]) is indistinguishable from East Barns, and another (8190-7750BCE [SUERC-19337]) is broadly contemporaneous with the earliest date from Warehouse 37 (Beckett *et al.* forthcoming). The evidence from Cramond effectively provides proxy evidence to sustain the notion that coastal pre-dated inland events in West Central Scotland.

The data from the research area highlights the continued problem of not being able to define the chronology of Mesolithic events at national and regional scales of enquiry. What can be said is that there is no known evidence for inland activities being earlier than coastal events. It follows that the coastal occupations were either earlier or coeval with inland pursuits. These chronological issues are implicit in discussions on the interpretations of beach pebble flint being found at inland sites (cf. Section 8.3.3), the attempt to define social boundaries and investigations into the scales of variation (cf. Section 8.6.4.1).

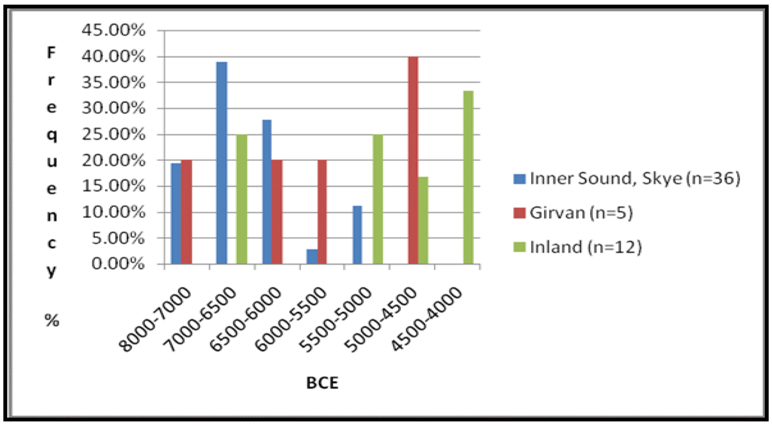

Figure 8.1: Comparison of calibrated radiocarbon dates from suite of dates from the Inner Sound, Skye (Ashmore and Wickham-Jones 2007) to calibrated radiocarbon dates from Girvan and inland sites.

8.3 Becoming: *chaîne opératoire* as variation

8.3.1 Initialising variation and becoming: raw materials

The procurement of raw materials is the first stage or 'moment' of the *chaîne opératoire*. Intra-regional variation is highlighted by the primacy for the utilisation of flint at mainland coastal sites and the general dominance of chert at mainland inland sites (Table 8-2). There are two excavated assemblages from inland sites on Arran which comprise of predominantly Mesolithic material, namely Auchareoch (Affleck *et al.* 1988) and Site 610, Machrie Moor (Finlay 1997c). Beach pebble flint dominates the assemblages (Finlay 1997e, 131; Affleck *et al.* 1988, 46), although pitchstone accounts for 9.15% of the artefacts from Auchareoch (Table 8.2). The use of pitchstone appears to feature more prominently in the Early Neolithic and beyond (after Ballin and Faithfull 2009).

	Total	Flint	Chert	Pitchstone	Quartz	Quartzite	Agate	Mudstone	Chalcedoony	Jasper	Coarse stone	Other	Indeterminate
Inland: Island													
Auchareoch, Arran	4567	3983		418	10		2	4					150
CTSA 1, Arran	18	12		6									
CTSE, Arran	664	32		626	6								
CTSF, Arran	14036	4046	8	9363	575		30		7	1	3		3
WBD, Arran	474	72		391	9		2						
WBF, Arran	2036	73		1947	10		3						3
Site 610, Machrie Moor, Arran	307	304		2	1								
Inland: Mainland													
Woodend Loch, South Lanarkshire	771	170	475					126					
Glentaggart, South Lanarkshire	1008		1006						2				
Howburn, South Lanarkshire	1099	541	552	1					5				
Smittons	713	175	521		17								
Starr 1, South Ayrshire	1123	536	587										
Coastal: Mainland													
Warehouse 37, Girvan	890	727	52	17	27							67	
Gallow Hill, Girvan	1460	1347	37	7	18		17			5		29	
Littlehill Bridge, Girvan		346	4		6		4	1			1		4
Turnberry	283	258	1		4	14	3			1		2	
Grants HQ, Girvan	35	30	1				4						
Garleffin, Ballantrae	100	94	3	3									

Table 8-2: Analysis of the raw material components of excavated assemblages. Mixed period assemblages are *italicised*.
References: Auchareoch (Affleck *et al.* 1988); CTSA 1, CTSE, CTSF, WBD and WBF (Donnelly and Finlay nd.); Site 610 (Finlay 1997d); Woodend Loch (Davidson *et al.* 1949); Glentaggart (Ballin and Johnson 2005); Smittons and Starr 1 (Finlayson 1989); Warehouse 37 (Finlay forthcoming a); Gallow Hill (Donnelly and MacGregor 2005); Littlehill Bridge (MacGregor and Donnelly 2001); Turnberry (Gould 2009); Grants HQ (Banks *et al.* 2008); Garleffin (Edwards 1996).

None of the chert from the assemblages considered here appears to have been quarried, which is in contrast to the evidence from south-east Scotland (cf. Warren 2007). The chert quarry at Broughton on the Biggar Gap provides only proxy evidence for Late Mesolithic extraction activities (after Biggar Archaeology Group 2010). A pattern which is also seen on Arran where small pitchstone pebbles from secondary fluvio-glacial deposits were preferred to undertaking quarrying extraction (Finlay 1997d, 132; Affleck *et al*. 1988, 46; Ballin and Faithfull 2009).

The utilisation of beach pebble flint and riverine pebble flint broadly equate at Ballantrae and Girvan. Inter-site and intra-site differences are noted in the variable percentage frequencies of flint at inland sites (Figure 6.1; Table 8-2). Based on a pitted/battered cortical surface to primary and secondary flint artefacts it can be seen that there is no evidence for the use of beach pebble flint at Climpy and Daer 85. The percentage frequencies for the other inland sites are shown at Figure 8.2. Apart from Powbrone, the utilisation of beach pebble flint is likely to be under-represented on the basis that the majority of flint artefacts are tertiary which may suggest that either opened material or pre-formed cores were brought to these inland locations from either the coastal margins, or fluvio-glacial deposits away from the activity areas (cf. Section 8.3.3).

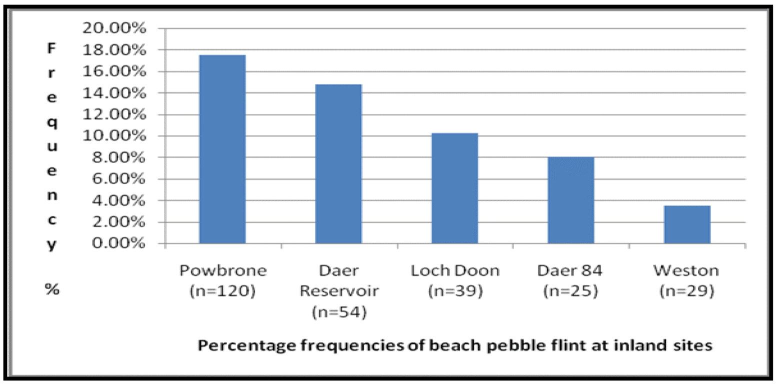

Figure 8.2: Percentage frequencies of beach pebble flint at inland sites showing numerical frequency of primary and secondary artefacts.

Raw materials also provide insight for the determination of inter-site variation. At Loch Doon the use of quartz as a complementary resource to chert and flint is not reflected elsewhere. Similarly, the presence of quartzite for predominantly bipolar reduction at Powbrone is a variation not recorded at any of the other assemblages within this study. Other raw materials are noted in low numerical and percentage frequencies. Intra-site variation is recognised at Daer 84 and Daer 85 based on the variants recorded in the cortical surface of chert, and at Climpy where locally resourced poor quality Carboniferous chert is found with superior quality Ordovician chert.

Daer Reservoir serves to demonstrate variation at intra-regional, inter-site and intra-site scales of enquiry. Firstly, the preference for flint for the manufacture of modified artefacts; a pattern replicated in other assemblages, e.g. from Starr 1 and Starr 2, Loch Doon (Tables 7-1 and 7-2; Finlayson 1989, 166-167). Secondly, the bluish-grey hue colouration of a high percentage frequency of flint and chalcedony artefacts appears to be unique to this location. It is possible that this raw material is present elsewhere at sites remaining undiscovered. These sites may be hidden by peat overburden or inundated following the construction of the dam. A majority of the chert artefacts are greenish grey, although there is more than a minimal presence of pieces with the bluish-grey coloration. Thirdly, the siliceous blue stone has been recovered from only two of the sites known at Daer Reservoir.

Variations in raw materials indicate different procurement strategies and may suggest different events and as memory moments allow the analyst to make enquiry into the possible identity of different hunter-gatherers groups (cf. Section 8.5).

8.3.2 Coastal flint: interpretive perspectives

The statistically exclusive utilisation of flint at Ballantrae and Girvan is not due to the unavailability of other good quality knappable raw materials. The chert from the Ophiolite complex follows the coast north from Ballantrae to just south of Girvan (Armstrong *et al.*1999; Dr A. Owen pers. comm.), with Ordovician chert stretching across the Southern Uplands to East Lothian and into Berwickshire (Owen *et al.* 1999; 1999a). Despite the scarcity of chert in the coastal collections, the artefacts show that larger pieces of chert were available in contrast to the small and medium size beach and fluvio-glacial resources exploited.

Mithen (1999) highlighted that our understanding of Mesolithic lifeways, including aspects of cosmology and symbolism, was poor. Cummings (2003, 67-79) with reference to ethnographic analogy with the *Saami* of northern Scandinavia considers the cosmological significance of water. Pollard (1996, 202-204) asked us to consider the coastal margins as a liminal place between the land and the sea where the rhythm of being was influenced by the changing tides. Based on the belief systems of the *Saami* these liminal zones have been interpreted as the metaphysical, as places of access to the spirit dimension (Chatterton 2003). These interpretive notions have a particular resonance given the lagoonal habitats at Girvan, and the stability of not only those habitats but also those at Ballantrae during the Late Mesolithic (after Jardine and Morrison 1976; Smith *et al*. 2006; 2007).

Stout's (2002) evocative ethnography of the *Balyo* adze makers of *Langda*, a village on the Indonesian island of *Irian Jaya* demands that raw materials have to be considered as something more than a mere resource for the production of stone tools. The *Balyo* mythology believes that the female pro-genitor of the clan *Alim Yongnum* gives birth to and controls the availability of the stone resources in the *Ey* River. Many of the places where raw material is harvested are imbued with spiritual significance. The procurement of raw material is socially constrained and regulated. The technological skill to work the stone comes from the male pro-genitor *Menmimy Malyoman Balyo*. The making of adzes is a highly developed and structured social phenomenon. When an adze is finished the veins within the raw material are painted red and white, i.e. the process of putting blood into the wounds of the artefact to give it back life (Stout 2002; Pétrequin and Pétrequin 2000 [1993]). The aboriginal belief systems of Western Arnhem regard stone resources as the embodiment of their ancestors (Taçon 1991, 197; Cummings 2003, 76).

Stout's (2002) work focused on cognitive approaches, however, an alternate and complementary reading of the deep play forces us to consider the underlying interpretive nuances of personhood and materiality. Non-human personhood is not uncommon among indigenous groups, e.g. the James Bay Cree of Canada (Feit 1995), and the *Mbuti* who understand the personhood of the *Ituri* rainforest as parent, the giver of life and the provider of food and shelter (Turnbull 1974

[1961]; 1983; Ichikawa 1996; 1999). Fowler (2004, 4) has defined personhood as a concept that:

> "may refer to any entity, human or otherwise, which may be conceptualised and treated as a person.......and denote the entity as having a form of agency."

The materiality of stone should not be reduced to a passive raw material but given meaning as a dynamic and living entity (after Stout 2002, 704) what in Deleuzian (1990 [1969]) parlance may be described as a 'body without organs'; as a mode of being (Message 2010, 39). The Balyo believe that stone ages; it is imbued with a life-cycle and given names. The older the stone the better; mirroring the perception of a person's technological prowess (Stout 2002). This tying together of the concepts of personhood and materiality fits coherently with an abstract and meaningful understanding of an embodied technology where people and things are inseparable as subject and object within the social dimension (after Gosden and Marshall 1999a; after Deleuze 2004 [1968]).

Cognisant of the caveats regarding ethnographic analogy across time (Spikins 2000; Jordan 2006) and contemporary analogy across space (Warren 2007), is it possible that the hunter-gatherer groups who occupied the coastal margins of Ayrshire conceptualised the sea and rivers and estuaries with personhood? For example, as elemental forces imbued with personhood they may be said to give birth to flint. The 'gift' of flint to the hunter-gatherer communities occupying the Ayrshire coast may have created a symbolic obligation where the utilisation of flint at the coast was inextricably woven into becoming and given cosmological significance by forging an inseparable bond of intra-regional lifeways, task and place.

8.3.3 Inland flint and chert: interpretive perspectives

Finlayson (1989, 199) suggests that the use of chert rather than flint at inland locations may be a feature of the Late Mesolithic. A notion that may be similarly applied to the use of pitchstone at inland sites on Arran, although possibly towards the end of the Mesolithic period bearing in mind the radiocarbon dates from Auchareoch (cf. Section 8.2.2). The presence of flint in inland assemblages has been interpreted as either evidence of an exchange commodity, or representative of pioneer incursions suggesting a generational scale of occupation (Finlayson 1989). The implication in the first case is for distinctive groups of hunter-gatherers who predominantly occupy either the coastal margins, or inland locations. Ethnographic evidence from Tierra del Fuego confirms this possibility with the coastal *Yamana* and inland *Selk'nam* (Vidal 1999; Spikins 2002; cf. Section 8.6.3.1). The exchange of flint would suggest a potentially prized resource for inland hunter-gatherer groups and may indicate the forging of alliances and the possible movement of people, e.g. by way of exogamous marriage, and others changing group affiliation within the wider community (cf. Section 8.6.4.1). Raw materials, in particular flint, as a signifier of pioneer movement are known from sites at Östergötland in eastern middle Sweden. Flint artefacts continued to be exchanged speaking to diachronic alliances to an ancestral past (cf. Larsson 2007). The use of quartz in these Swedish assemblages has been interpreted as representative of new group identities (*ibid*, 34). If flint was cosmologically related to water and coastal occupation then is it plausible that chert may have been viewed, analogous to the aboriginal dreamtime, as a 'gift' born out of the earth as ancestor (after Taçon 1991, 197). This may in part form the basis to offer an interpretation of how the hunter-gatherer groups who occupied the inlands of South Ayrshire and South Lanarkshire understood their taskscape (cf. Section 8.4). The elements of water and earth may be tentatively interpreted as imbued with personhood with sacred and cosmological significance which is synonymous with the proscribed use of different raw materials.

The distinctive variation in the colour of raw materials and the siliceous blue stone so far found exclusively at Daer Reservoir needs to be considered. This unique composition of the assemblages from Daer Reservoir suggests that raw materials were sourced in the Southern Uplands to the south. The analyst is drawn to the aesthetic quality of these bluish-grey raw materials, which may have some bearing of what is going in the landscape of the Lowther Hills. The *Balyo* have a hierarchy of spiritual significance for the locations where raw materials are harvested (Stout 2002, 697). Daer Reservoir may indicate an intra-regional variation with a profound hierarchical cosmological link between source and occupation; the spirituality of the landscape in greyscale. For example, was it necessary for hunter-gatherer groups using the locations at Daer Reservoir to use specific raw materials, and do the assemblages represent ancestral occupations of, say, one or two groups or a place of special significance for all hunter-gatherer groups during the Mesolithic period? The events at Daer Reservoir are explored with particular reference to the interpretations from the site of Waun Fignen Felen in South Wales (Barton *et al*. 1995; cf. Section 8.6.4.2).

8.3.4 Becoming: Variation in the coastal and inland assemblages

8.3.4.1 Technological practice

The use of bipolar and platform reduction strategies are noted at both the mainland coastal and inland sites, although low frequencies of bipolar cores were recorded at Climpy and Daer Reservoir. The small section on primary technology in the report from Auchareoch makes no distinction between reduction strategies, although the inference is that the assemblage is predominantly from platform reduction (Affleck *et al*. 1988, 47-48).

Blanks show that quartzite at Powbrone is the only raw material which was predominantly worked using the bipolar technique, although quartz broadly equates between the two reduction strategies. There is limited evidence from platform cores and blanks for the anvil support of cores at coastal and inland sites suggesting that these techniques were coeval. The comparison of percentage frequencies of platform and bipolar blanks to platform and bipolar cores at Powbrone suggested that platform cores were under-represented. Statistical analysis of the length of cores inferred that platform cores may have been reworked as bipolar cores, potentially indicating that bipolar reduction was a complementary strategy to platform reduction. In this regard Powbrone can be distinguished from the other sites, apart from one bipolar core from Daer 85 which may have been used previously for platform reduction.

The dominance for the utilisation of simple platforms and the preference for a softer hammerstone producing a diffuse bulb of percussion for bipolar and platforms blanks are shown at Figures 8.3 and 8.4.

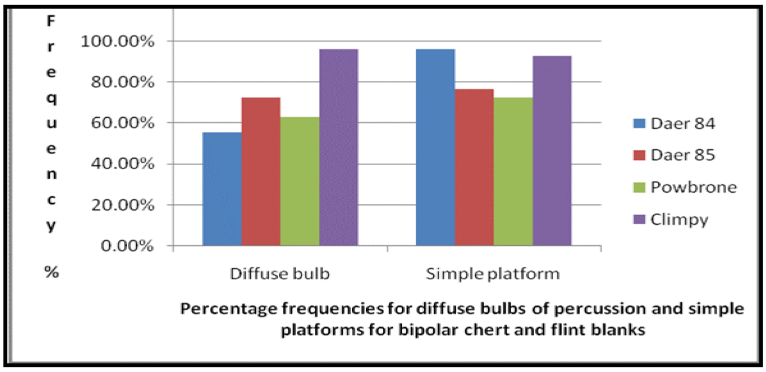

Figure 8.3: Percentage frequencies for diffuse bulbs of percussion and simple platforms for chert and flint bipolar flakes and blades.

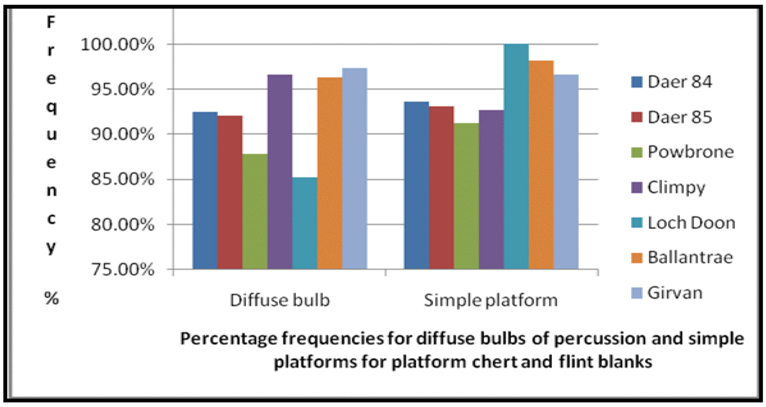

Figure 8.4: Percentage frequencies for diffuse bulbs of percussion and simple platforms for chert and flint platform flakes and blades.

8.3.4.2 Bipolar

There are common differences in the mean length of flint bipolar cores ranging from 28.29mm at Ballantrae to 24.00mm at Powbrone (Figure 8.5). The average number of scars for all bipolar cores equates at 12.1 for Ballantrae and 12.3 for Girvan; figures which mirror the limited data from Daer Reservoir, Loch Doon and Weston. The higher populations of bipolar cores from other inland sites have visible scars ranging from 6.2 at Powbrone to 6.7 at Daer 84. Common differences are also noted in the platform stage analysis where core reorientation generally involves the use of three or more platforms.

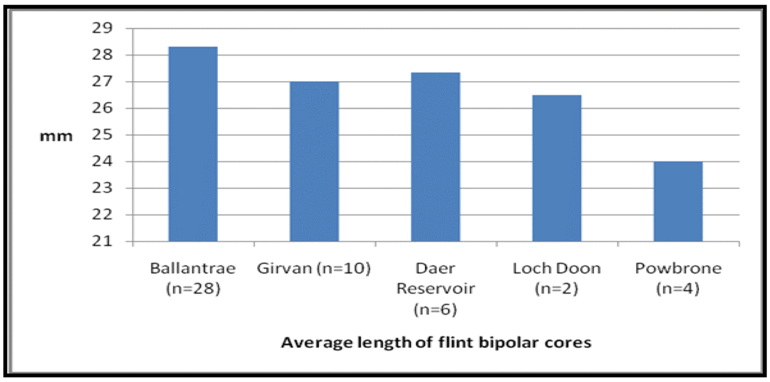

Figure 8.5: Average length of flint bipolar cores.

Primary blanks are more common at Ballantrae and Girvan where bipolar reduction was used as an opening strategy for flint pebbles with no corresponding evidence from the inland sites. Previously opened raw material or pre-formed cores are a feature of the inland assemblages, and it is not possible to determine if this strategy was used at either the inland procurement source, and/or primary knapping locations. Elements of the bipolar component of the coastal and inland assemblages may relate to different temporal episodes and possibly post-Mesolithic events, although the profile of the artefacts is not unrepresentative of Mesolithic activity.

The recovery of *pièces esquillèes* from Daer 84 and Daer 85 indicate variation at intra-regional and inter-site scales. They may indicate task differentiation during an episode(s) of activity in the working of organic materials.

8.3.4.3 Platform core rejuvenation strategies

Regional patterning is visible in platform core rejuvenation strategies where flakes and blade-like flakes are struck to remove step and hinge terminations to the core flaking surface. Plunging terminations are also evident to remove step and terminations and accumulations of material at the distal end of the core. Inter-site variation is recorded at Daer 84, Daer 85 and Powbrone in the removal of part of the platform using a transverse blow from the left.

8.3.4.4 Blade industries and blade and non-specific platform cores

The *lamellar* index (Bordes and Gaussen 1970) attests to the presence of blade industries at each of the inland sites. From the analysis of cores, a scoping appraisal of the blanks and a review of published assemblages confirm blade industries at the coastal sites of Ballantrae and Girvan (Lacaille 1945, 88-89; MacGregor and Donnelly 2001, 7; Donnelly and MacGregor 2005, 56). The situation at Auchareoch is more complicated. The Allen surface collections produce at index of 13.56 which statistically equates to Loch Doon at 14.9 (cf. Section 6.5.6). However, the *lamellar* index reduces to 7.54 when excavated and other collected material is aggregated. The inference is that bias in surface collections may either over-inflate the *lamellar* index, or the assemblage conflates the different tasks areas and events and thereby nullifying the possible integrity of the index.

An analysis of the platform cores with evidence of blade production reveals intra-regional variation and inter-site variation within the inland assemblages (Figure 8.6). There are general common differences in the percentage frequencies of blade platform and non-specific platform cores at Ballantrae and Girvan. The inland assemblages nearest to the coastal frequencies of non-specific platform cores are Climpy and Daer Reservoir. The patterning demonstrates the dominance of blade platform cores apart from Weston, which is the only site where non-specific platform cores have a greater occurrence than blade platform cores. The broad common differences in the patterning for the inter-changeability of cores for blade and flake production are evident in the coastal assemblages and at Weston, Climpy and Daer Reservoir. The evidence from Daer 84, Daer 85 and Powbrone indicates a more pronounced distinction in the utilisation of blade platform and flake platform cores for specific blank production. This may reflect either task differentiation or different temporal events.

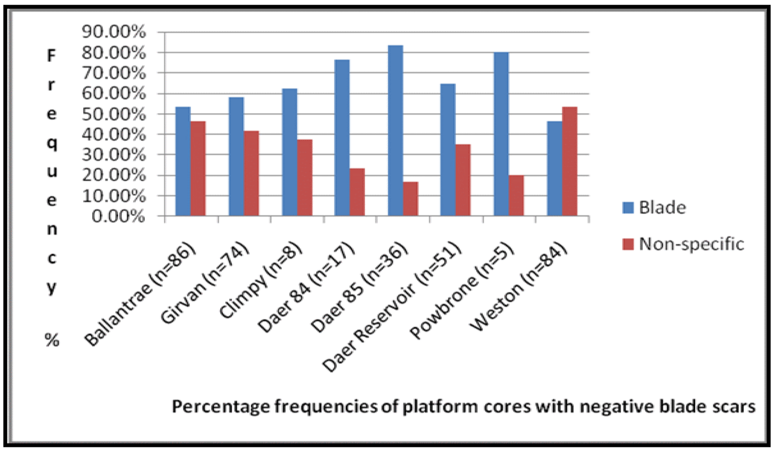

Figure 8.6: Percentage frequencies of platform cores with evidence of blade production.

8.3.4.5 Platform blades and flakes

The relative scarcity of flint primary blanks at the inland sites, including Auchareoch, when compared to the coastal collections may suggest decortication across the landscape as flint moves inland from coastal resources. A scoping appraisal of the flint blanks from Daer Reservoir and Weston indicate similar percentage frequencies to the patterning at Daer 84 and Daer 85 (Figure 8.7). The collections from Powbrone and Loch Doon appear to be anomalous. None of the flint artefacts with cortex present from Climpy and Daer 85, and only one from Daer 84 have a pitted/battered cortical surface. A pitted/battered cortex is recorded on 10.26% of flint artefacts from Loch Doon with cortical remains; Powbrone 15.91%.

There are no flint cores from Climpy and Daer 85, and neither of the two flint cores from Daer 84 have a pitted/battered cortical surface. The flint cores from Daer Reservoir, Loch Doon, Powbrone and Weston indicate the use of beach pebbles (Figure 8.8). Approximately 10-15% of the flint debitage from Daer Reservoir presents with a water-rolled smooth/chalky cortical surface from secondary resources which feasibly may have originally collected from the beach.

From this limited evidence, beach pebble flint is being utilised at Daer 85, Daer Reservoir, Loch Doon, Powbrone and Weston. The cortical surface indicates that riverine and fluvio-glacial pebbles as a resource are more common. It should also been borne in mind that nearly half of flint utilised at Ballantrae and Girvan suggested non-beach pebble exploitation. It is possible that beach pebbles and flint from littoral riverine/fluvio-glacial resources may have travelled inland from the coastal margins with hunter-gatherer groups or though trading networks. Conversely, flint may have been available from inland moraines and other sources.

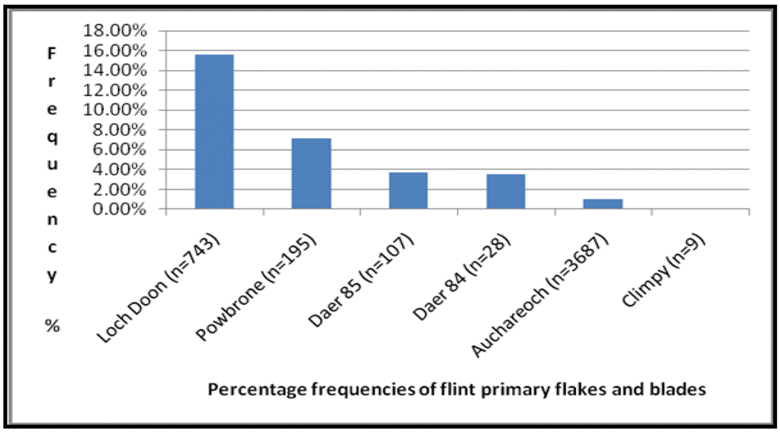

Figure 8.7: Percentage frequencies of flint primary blanks.

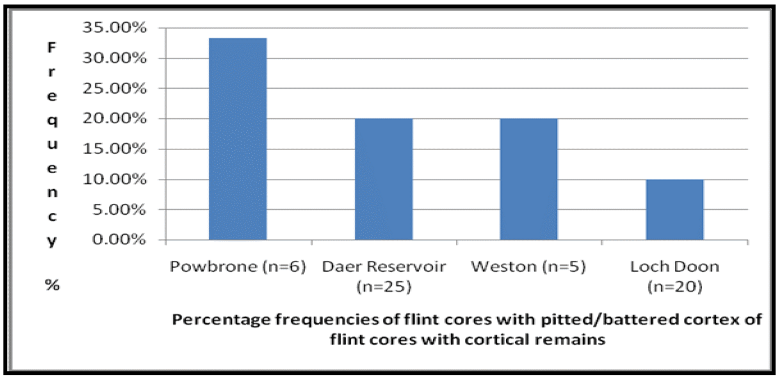

Figure 8.8: Percentage frequencies of flint cores with pitted cortex of flint cores with cortical remains present.

Apart from Powbrone, there are marked common differences in the average length of flint platform blades suggesting a close correlation in the conceptual production of these blanks on a regional scale (Figure 8.9). It is more difficult to see intra-regional patterning for chert platform blades at the inland sites, although general common differences are noted at Daer 84 and Daer 85 and at Powbrone and Loch Doon. The mean length of chert platform blades from Climpy may be biased because of the complementary utilisation of local poorer quality Carboniferous chert with the inherent increased risk of fracture [Figure 8.10] (after Ballin and Johnson 2005).

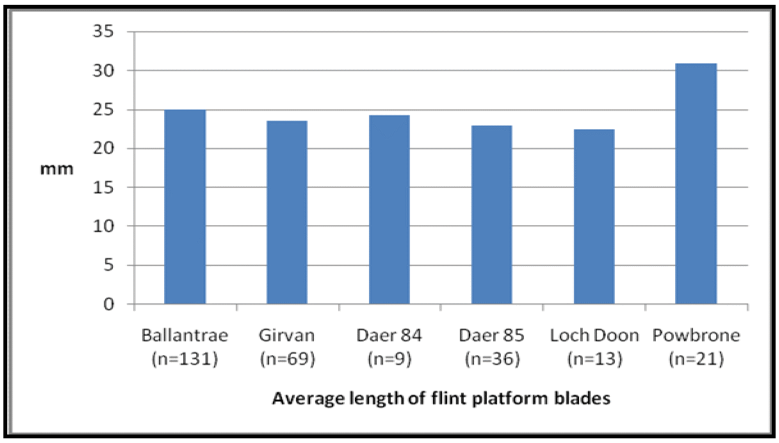

Figure 8.9: Average length of flint platform blades deemed complete for measurement.

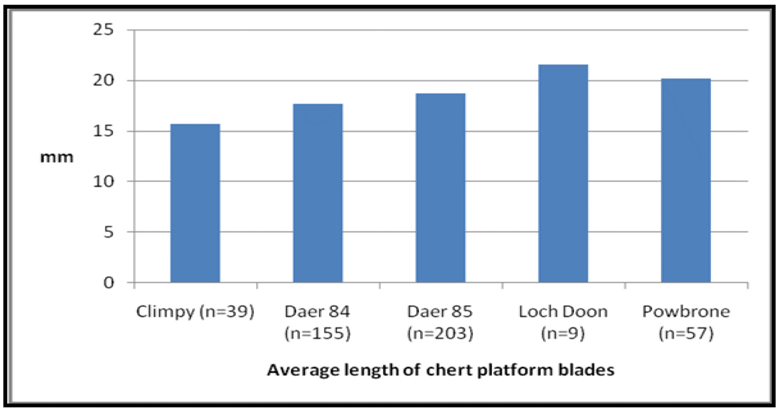

Figure 8.10: Average length of chert platform blades deemed complete for measurement.

Intra-regional patterning is evident in the proximal profile of chert and flint platform blades (Figure 8.11). The common differences in the collections from Ballantrae and Girvan are pronounced. The higher incidence of complete blades from Ballantrae may be as a result of increased scrub preparation to the core surface prior to removal (Figure 8.12). The percentage frequencies for an absent proximal end are generally higher at the inland assemblages, which may be due to the increased utilisation of chert. However, the regional patterning for blades with a missing proximal end indicates a conceptual scheme which may be related to retooling tasks utilising blade segments.

There appears to be a direct correlation between the regularity of platform blades and scrub preparation (Figure 8.12). The intra-regional distinction appears to mirror the utilisation of flint, which may also account for the disparities of regularity in the inland platform blade populations. For example, the percentage frequencies of regularity are higher at Daer 85 and Powbrone where there is an increased occurrence of flint blades. Climpy stands apart because of the use of Carboniferous chert, where scrub preparation is greater and complete blades and regularity is lower than at the other inland sites.

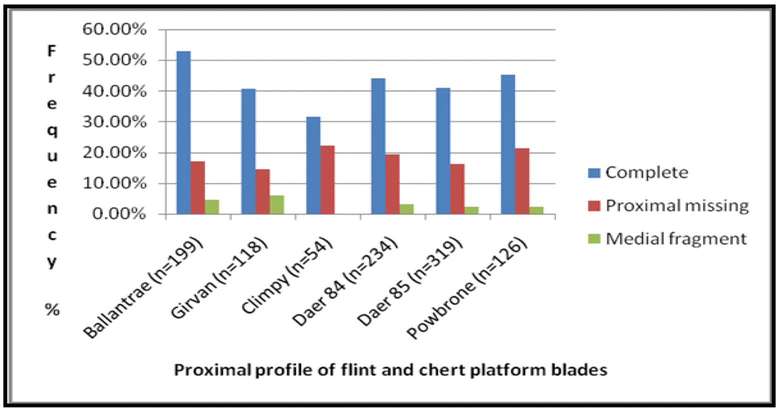

Figure 8.11: Proximal profile of chert and flint platform blades.

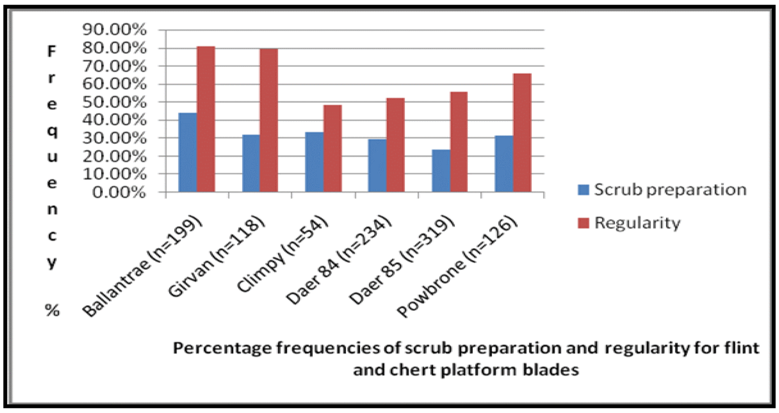

Figure 8.12: Percentage frequencies of scrub preparation and regularity of flint and chert platform blades.

The production of platform flakes shows distinct conceptual intra-regional preferences. The common differences in the inland assemblages for metric data across three measured variants are profound, regardless of whether flint or chert is the raw material of choice (Figure 8.13). Comparable common differences are also noted at Ballantrae and Girvan, although the platform flakes are considerably longer and wider than those recovered from the inland sites, possibly reflecting task differentiation.

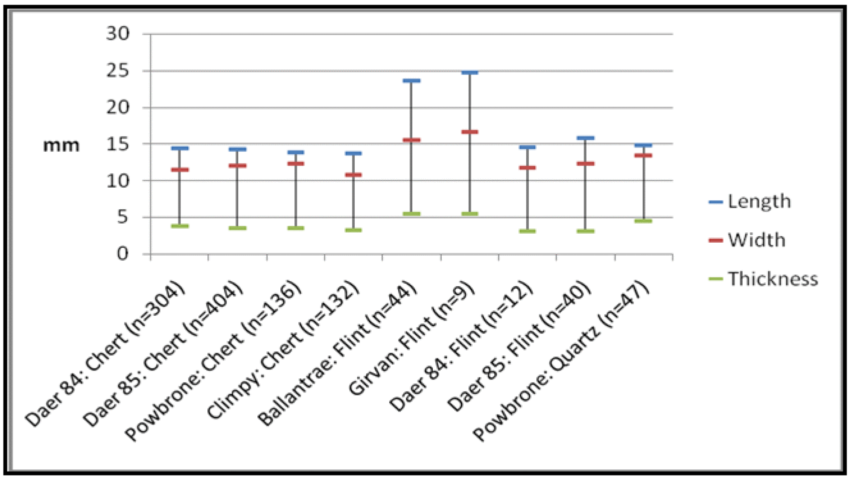

Figure 8.13: Metric data from the analysis of platform flakes deemed complete for measurement.

8.3.4.6 Secondary technologies

The Shannon-Weaver Diversity Indices demonstrates a greater diversity of tool forms at Ballantrae and Girvan compared to the inland assemblages (Figure 8.14). This is mainly due to higher occurrences of truncations, scrapers and other tool forms.

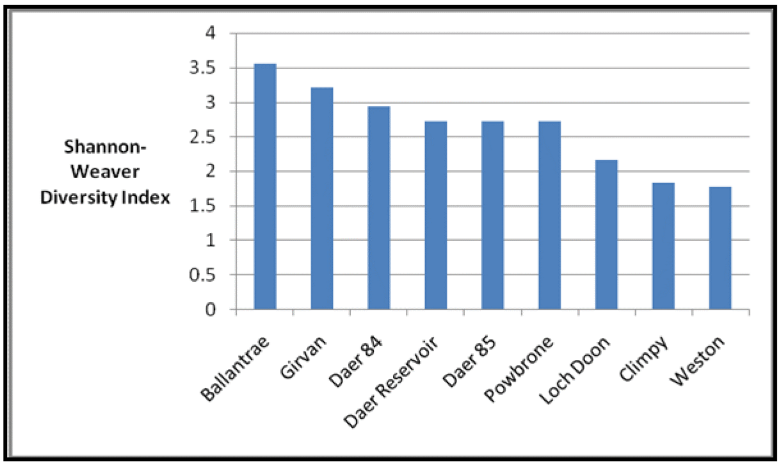

Figure 8.14: Diversity of retouched artefacts using the Shannon-Weaver Diversity Index.

Intra-regional variation can generally be seen in the relatively low frequencies of microliths and higher incidences of oblique truncations at the coastal sites (Figure 8.15). The scarcity of microliths at Loch Doon and Powbrone is not unknown at inland sites in South Lanarkshire, e.g. Glentaggart (Ballin and Johnson 2005). The higher percentage frequencies of scrapers appear to correspond to those sites where microliths are uncommon, i.e. Ballantrae, Girvan, Loch Doon and Powbrone, although it must be remembered that microliths were recovered in greater numbers during the excavations of the Starr sites on the shores of Loch Doon (cf. Finlayson 1989). The evidence from the coastal sites, Loch Doon and Powbrone may be as a result of collection bias. The sampling strategy is not an issue as all of the microliths from those sites were subject to technological analysis.

Disregarding Weston, because the sampling strategy favoured microliths, Climpy (80.49%) and Auchareoch (81.71%) can be distinguished from the other inland sites where microliths dominate the tool forms. The paucity of scrapers and absence of oblique truncations indicate inter-site variation. The domination of microliths coupled with the lack of scrapers may indicate common differences in the tasks undertaken at Climpy and Auchareoch. Microliths as the majority of tool forms is noted at Daer 84, Daer 85 and Daer Reservoir.

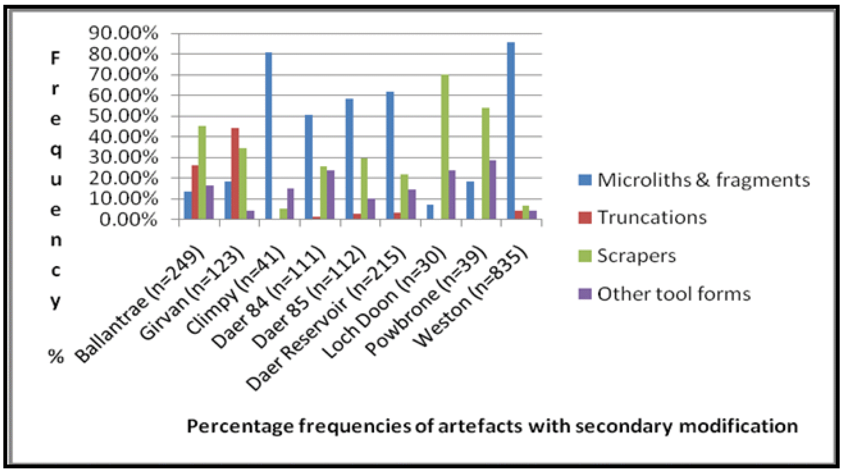

Figure 8.15: Percentage frequencies of artefacts with secondary modification.

Microburins have been recovered from all sites where microliths have a significant numerical presence other than Climpy. This together with the comparison of mean blade and microlith lengths indicates that microliths were manufactured at the coastal sites and Daer 84, Daer 85, Daer Reservoir and Weston.

Microliths from Ballantrae, Climpy, Daer 85 and Weston have a modal length of 11cm, with 13mm for Girvan and Weston and 10mm at Daer 84. The average length ranges from 14.84mm at Daer Reservoir to 12.3mm at Ballantrae, and the maximum difference in width is 1.69mm. The variations suggest a regional pattern for microlith size. There are common differences in the average lengths and modes of microliths from the SHMP assemblages, apart from Coulererach which appears to be anomalous reflecting the greater size of the blades produced at that site (Finlay *et al*. 2000, 576; Figure 8.16).

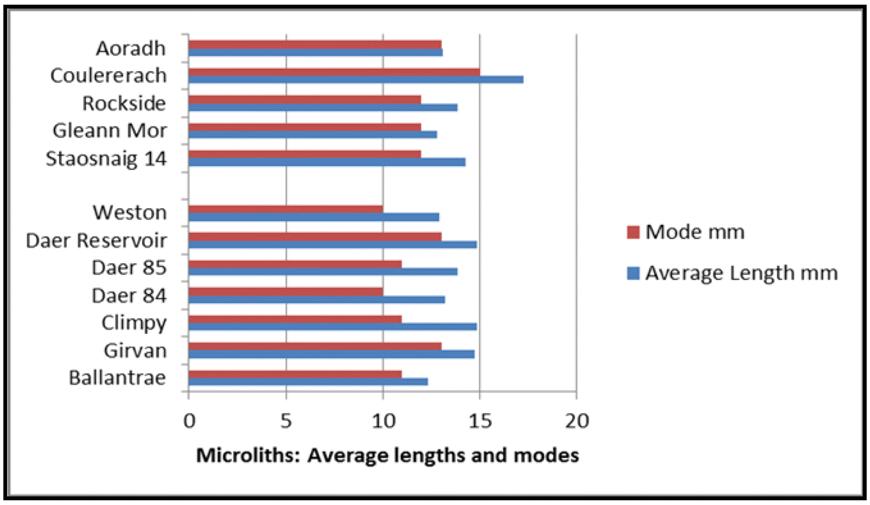

Figure 8.16: Comparanda with SHMP assemblages of average lengths and modes of microliths.

Intra-site variation at the coastal sites distinguishes Girvan from Ballantrae with the presence of a crescent and needle points; backed bladelets and scalene triangles dominate the collections. The inland sites may be classified where scalene triangles are the most common, i.e. Climpy, Daer Reservoir, Weston and Auchareoch compared to those sites where backed bladelets have the highest percentage frequency, i.e. Daer 84 and Daer 85 [Figure 8.14] (cf. Section 8.6.4.2). The metric dimensions of microliths suggest that blades were invariably used for the manufacture of microliths. It is possible that blade-like flakes and irregular blades may also have been used at Daer Reservoir based on the evidence of the shaping strategy.

Regionally, abrupt retouch is preferred for microliths followed by *enclume*, except for Daer 84 where the occurrence of *enclume* is marginally higher.

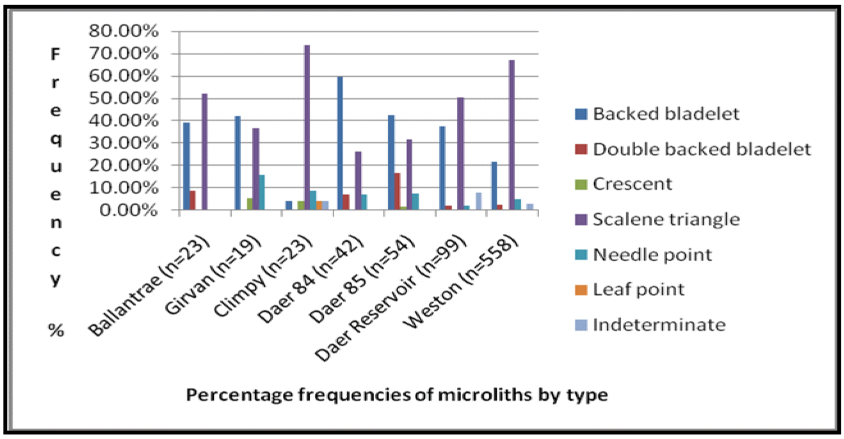

Figure 8.17: Percentage frequencies of microlith by type.

There are three possible interpretations for the paucity of microliths at coastal sites, bearing in mind that excavated assemblages in these areas do not produce microliths in statistically greater numbers than surface collections (Donnelly and MacGregor 2005, Table 4). The bias of surface collection may be at odds with the excavated assemblages on the basis of the ratio of microliths to other tool forms, albeit that there are very few excavated coastal assemblages. Firstly, Gallow Hill, Girvan may represent a retooling centre where a greater emphasis was placed on repair as opposed to the manufacture of microliths (Donnelly and MacGregor 2005, 52). This assumes that the ratio of microburins: microliths is statistically meaningful to interpretation without recourse to other data, and that all microburins present with attributes to permit them to be classified as such (cf. Finlay 2003b, 174). The evidence from notch and snap truncations (see below), and blade blanks suggests more than retooling, with the local production of microliths. Secondly, there was a less intensive production of microliths where the wide array of tasks associated with microlith forms was potentially sub-ordinate to other undertakings. Thirdly, microliths were produced for the exploitation of nearby marine, lagoonal and riverine resources away from production areas. This is reminiscent of the patterning seen at Oliclett, Caithness (Pannett 2007), although there are issues with the contemporaneity of the task areas. Hafted composite tools may have been lost or damaged during these forays, which may have resulted in retooling but not necessarily, or exclusively at manufacturing locations.

Truncations other than microburins have been recovered from Ballantrae, Girvan and Weston. For oblique truncations intra-regional variation is noted by reference to the end truncated. The patterning at the coast shows that the truncation of the proximal and distal ends broadly equates with the proximal end dominant at Weston. The lateralisation of the artefacts infers inter-site differences with the left hand side preferred at Ballantrae and the right hand side with a marginally greater frequency at Girvan. The size dimensions of oblique truncations are smaller at Weston which may be due to the propensity for the truncation of the proximal end.

The ratio of notch and snap truncations for Ballantrae and Girvan is 3.22:1, which highlights inter-site variation in the coastal collections coupled with preference for the high percentage frequencies for distal truncations, lateralisation and the presence of a bulb of percussion at Ballantrae. Common differences between Girvan and Weston may be seen in the end truncated, lateralisation and truncations with a bulb of percussion. Notch and snap truncations may represent errors arising from the microburin technique, and it is possible that the ratio differential between Ballantrae and Girvan is over-stated which may account for apparent inter-site imbalance in the frequency of microburins. The ratio of microburins and notch and snap truncations, where the notch is situated on the truncation, to microliths and microlith fragments for Ballantrae is 1:1.5; Girvan1:1.36. 34.17% of the blades analysed from Ballantrae are blade segments; Girvan 42.37%. The evidence implies that the microburin technique may not have been exclusively used in the production of microliths.

Other than Climpy and Auchareoch, which do not feature in this analysis, there is a diverse range of scrapers found at all sites. Any comparanda of scrapers must be undertaken against the biases outlined at Sections 5.3.5 and 7.3.4. Angled and sub-angled scrapers, which are typical to the Mesolithic period (after Wickham-Jones and McCartan 1990, 91), have been recovered from coastal and inland sites. Disregarding scraper fragments the differing percentage frequencies show inter-site variation at a regional scale (Figure 8.18).

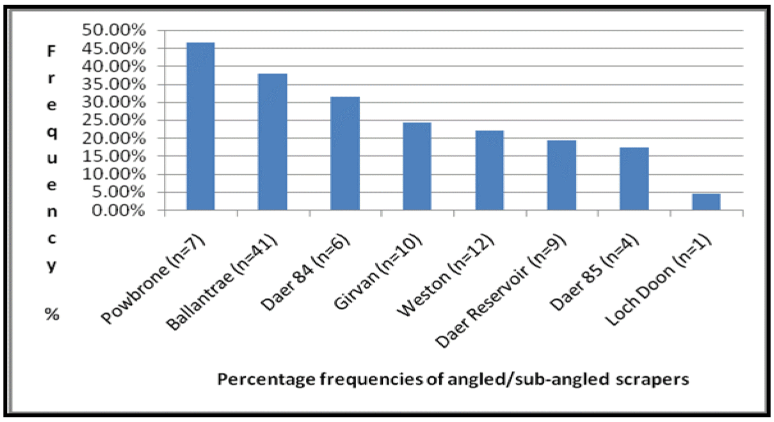

Figure 8.18: Percentage frequencies of angled/sub-angled scrapers disregarding scraper fragments.

The ratio of convex to thick forms highlights either two or three possible patterns based on arbitrary boundaries (Table 8-3). What is particularly interesting is that the highest ratios are recorded at Loch Doon and Daer Reservoir. The Ordnance Survey 1921-30 does not show a body of open water at Daer Reservoir, although the contours do indicate a relatively wide floodplain for Daer Water (Figure 8.19). It is possible that the variation on convex forms may relate to specific tasks carried out these locations (after Finlayson 1989).

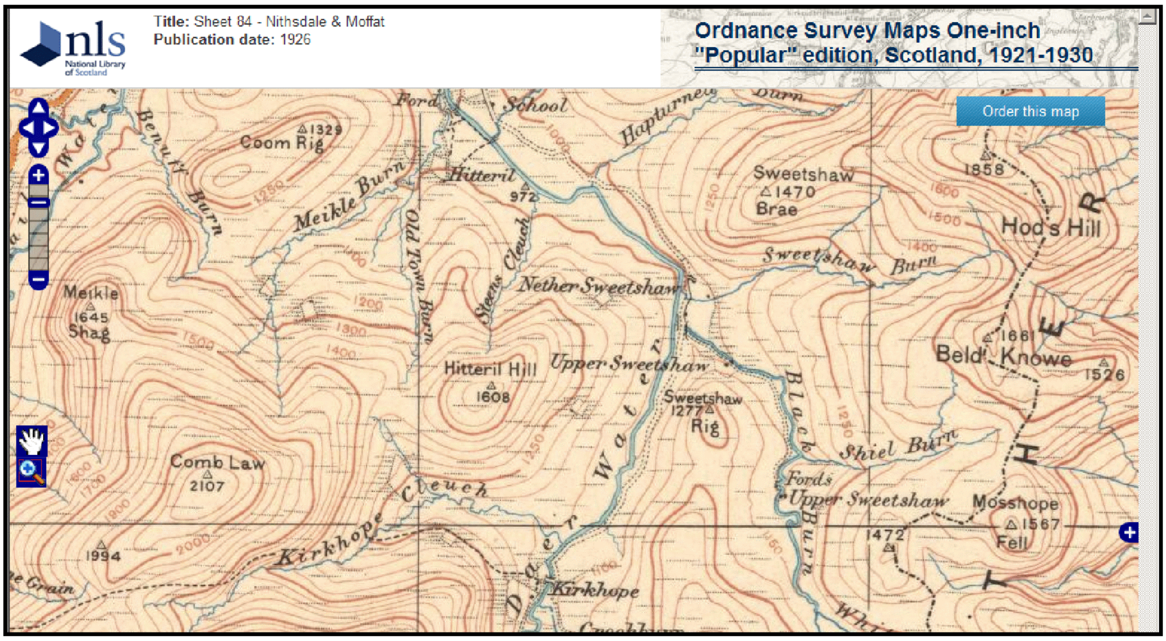

Figure 8.19: Section of Sheet 84, Ordnance Survey Map 1921-30. The Daer Valley and Daer Water prior to construction of the Daer Reservoir dam in the 1950s. © Crown copyright 1926. Available online from the National Library of Scotland webpages.

	Convex	Thick convex	Ratio
Daer Reservoir	43.48%	6.52%	6.67:1
Loch Doon	57.14%	9.52%	6.00:1
Powbrone	19.05%	4.76%	4.00:1
Ballantrae	30.36%	8.04%	3.77:1
Weston	48.15%	16.67%	2.88:1
Girvan	38.10%	14.28%	2.67:1
Daer 84	28.57%	10.71%	2.66:1
Daer 85	30.30%	15.15%	2.00:1

Table 8-3: Percentage frequency of convex scrapers and thick convex scrapers, and the ratio of convex scrapers to thick convex scrapers.

8.4 Being: continuity of technological practice

Regional studies have demonstrated the continuity of technological practice throughout the greater part of the *longue durée* of the Mesolithic period in Scotland (e.g. Mithen 2000; Hardy and Wickham-Jones 2002; 2003; 2007). This is further affirmed by the work undertaken for this study on the technological analysis of the coastal assemblages from Ballantrae and Girvan, and the inland assemblages of South Ayrshire and South Lanarkshire (cf. Section 8.3.4.2; Chapters 5, 6 and 7).

The social dimension is the forum for variation which is created by repetition (Deleuze 2004 [1968]). Technological analysis determines that variation abounds at the scale of micro-phenomena (Chapter 5, 6 and 7), but how can the apparent contradiction of the stasis of technological practice as a macro-phenomenon be explained? Stasis is inherent to the first and second repetitions which the third repetition and the synthesis of reciprocal determination negate and drive variation (Table 8-4). The importance of material culture within groups was the focus of Shankar's (2006) study of the South Asian American *Desi* communities of Silicon Valley in California. Shankar convincingly demonstrated that it was not material culture that had agency, but the objectification of practice relating to material culture within a performance setting. The continuity of technological practice should not be regarded as passive but as a dynamic played out within the social dimension. It may be said that where repetition for Bourdieu (1977 [1972]) is explicit as a 'way of doing', repetition for Deleuze (2004 [1968]) is a 'way of becoming'.

The macro-phenomenon of technological practice highlights disconnections in the Deleuzian scheme for variation (Table 8-4) forced by the agency of performance as being. In contrast, being is made manifest at the micro-scale by the trajectory of variation in things and people as subject and object in the social dimension (after Gosden and Marshall 1999a). It is at the micro-scale where the second repetition as the relational connections to explain how things change, and the third synthesis of reciprocal determination as the relational aspects of 'forget everything' and the unconscious triggers are at play (after Deleuze 2004 [1968]; after Williams 2003, 14-16).

Principles

1. Reason: Agent is connected to things that promote and instigate action.
2. 'Forget everything': Allows agent to react to change and difference in things and forge new connections.

Repetitions

1. Habitual: Embodied practice.
2. Recognition: Representational significance of difference.
3. Abstract: Relational connections to explain how things change.

Synthesis

1. Experience of earlier repetitions: Memory as rhizome.
2. Ideal & asymmetrical: Variation as concept and driver of habitual, recognition and memory.
3. Reciprocal determination: Relational aspects of 'forget everything' and unconscious triggers.

Table 8-4: Synopsis of Deleuzian principles, repetitions and synthesis to understand difference or variation (Deleuze 2004 [1968]).

8.5 Primacy of difference in becoming: identity and group identities

The recurring theme throughout *Difference and Repetition* (Deleuze 2004 [1968]) is that there is no identity. Firstly, the social body through repetition creates variation. Each person and thing, as a detached part of a person, are the product of a network of social relations and will be uniquely constituted. Identity does not have a primacy over difference; it is difference or variation through repetition that creates 'identity'. The social body seeks to create the person based on the virtual concept of 'pure becoming', however, actualisation produces 'becoming' It is the difference between 'pure becoming' and 'becoming' that produces variation from one person or thing to another (after Deleuze 2004 [1968]). Becoming is diachronic and as such for Deleuze a person is never well defined and, therefore identity is in a perpetual state of flux through the repetition and the renegotiation of relationships, connections and disconnections in the social dimension.

The lithic is a snapshot of a conflation of moments within the *chaîne opératoire*. For example, the type of raw material, colour and cortical surface speaks to the 'chosen moment' of procurement. Each subsequent attribute, as the partible distributed technician, is indicative of 'memory moments'; the basis of academic enquiry for this study into personal identity and group identities. The attributes of the artefacts as 'memory moments' within the assemblage are the multi-authored product of the multi-authored person, where the distributed technician understood as subject and object may reveal aspects of personal identity and group identity.

Rarely, is it possible to differentiate the work of the technician where, as is the case here, it has not been possible to refit artefacts. The recognition of common differences often comes down to the granularity of technological attribute analysis. For example, the form of retouch coupled with the lateralisation of artefacts, and sometimes the common differences in the morphology of modified artefacts. The common differences in the form of microliths, especially scalene triangles, determine that it is possible to distinguish the work of a particular technician in the assemblages from Climpy, Daer 84, Daer 85, Daer Reservoir and Weston. By understanding technology as somatic and inseparable from being, as subject and object, it allows the analyst to see the technician in grey undefined. It is only possible to give meaning to minor aspects of the multiple facets of those personal identities.

The dynamic of the 'technological stasis of being' blurs distinctions between different groups of hunter-gatherers. Studies on group identity in psychology suggest that the membership of a social network is a form of self-verification within the social body (Burke and Stets 1999; Stets and Burke 2000). Self-verification represents normative behavioural practice. The person's agency has to be initially constrained to join the group and it then enhanced by being a member of the social network, which in turn is augmented by that person's membership. Although not referred to in the psychological texts referenced, the theoretical underpinning to this may be found in the analytical philosophical concept of supervenience (cf. Kim 1990). Social networks should not be reduced to a state of enduring normative behavioural practice; conflict must be considered. A recent brief synthesis of ethnographic accounts of hunter-gatherers by Layton and O'Hara (2010) define the social network as both fluid and permeable, where membership of different groups is frequently changed. This fluidity acts as a levelling mechanism to avoid confrontation and disputes (*ibid*, 88; 103). The 'stasis of being' would, therefore facilitate movement between networks. Layton and O'Hara (2010, 85) go on to advise that neighbouring hunter-gatherer groups habitually recognise the mutuality of rights of access to the territories of other groups, which may account for the variations in the assemblages at Daer 84 and Daer 85 (cf. Section 8.6.4.1).

The evidence from West Central Scotland suggests that the demarcation between one hunter-gatherer group and another may be said to hinge on the initial stages of the *chaîne opératoire*, i.e. where the 'chosen moment' signifies variation from the repetition of procurement and source of raw materials. These groups may not have been contemporary. The interpretation also assumes that variations in raw materials from potentially different sources are viable as an indicator of group preference manifest as differentiation in group identities (cf. 8.6.2).

8.6 Landscape: the becoming taskscape and social boundaries

8.6.1 Inscribing the landscape

The hunter-gatherers of the Mesolithic period created 'place' out of 'space' (after Low and Lawrence-Zuniga 2003), and 'landscape' into a 'taskscape' (Ingold 2000 [1993]) of meaning, myth and metaphor (Cummings 2003). Conneller (2000a, 146) counters against notions of a fragmented taskscape comprising of a composite of activity areas, but redefines the taskscape as a rhizome, a landscape in greyscale which for this study represents variation in the density of activities made manifest as lithic assemblages. Persig (1984 [1974], 83) envisaged the taskscape 19 years before Ingold's (2000 [1993], 190-208) seminal paper.

> "...it's necessary to see that part of the landscape, inseparable from it, is a figure in the middle of it, sorting sand into piles. To see the landscape without seeing this figure is not to see the landscape at all. To reject that part of the Buddha that attends to the analysis of motorcycles is to miss the Buddha entirely".

If Persig's underlying view of technology is reconfigured as an embodied enchainment; a power that is inseparable from the agent as opposed to a passive object of study, and people and things are understood as both subject and object he may be said to be referring to the inseparable quality of Mesolithic lifeways as agent and things, technology, the social dimension and the landscape; the double Möbius strip. It may be argued the presence of the hunter-gatherer in the landscape creates 'place', but it is the desire of the agent as technology that inscribes and gives meaning to the taskscape. This approach may be distinguished from Edmonds (1997), McFadyen (2006), Dobres (2001) and others, where the lithic assemblage is seen as the manifestation of past actions, and not as the partible distributed technician (after Gosden and Marshall 1999a; after Deleuze 2004 [1968]).

8.6.2 Identity and the taskscape

The lithic assemblage can be described as a spatial mnemonic, a phrase borrowed from Gatewood (1985, 206-207), of temporal identities. These 'memory moments' may affirm identity and reaffirm ancestral claims to place, raw material resources and alliances with other hunter-gatherer groups who have undertaken activities at the same site, e.g. Daer 84 and Daer 85. Any interpretation of 'memory moments' as indicators of the metaphysical aspects of group identities is contingent on a configuration of time and a sense of the past.

How can the assemblage convey abstract notions of group identities on a generational scale? Zourabichvili (2004, 99) informs us that Deleuzian insight demonstrates that difference or variation is a forum for communication. For example, if we understand the lithics and the lithic assemblages as a communication between heterogeneities, the connection to the assemblages creates a "contagion" across distance (after Zourabichvili 2004, 99; after Viveiros de Castro 2010, 225). The contagion is, therefore, the diachronic link to place and it is those links to raw material resources across the landscape that offer insight into group identities.

Notions of time have a long tradition of academic enquiry in archaeology and other disciplines (cf. the bibliography in Lucas 2005). Deleuze (1990) asks us to consider time not as linear trajectory but as a seriatim of becoming, that is a non-sequential eternal concept (Colebrook 2009, 6); a divergence from the historicity of time which is not ontologically differentiated, but a variation in understanding the concept of time (Patton 2009, 38-39). Time comprises of events which have to be recognisable and identifiable as occurrences. As a sign, new events must have the potentiality of the unknown (Derrida 2003, 90), which have to be interpreted to understand their ambiguous relationship to time (Patton 2009, 42). For example, when did an event occur (*ibid*)? This ambiguity permits Deleuze (2004 [1968]) to redefine stratigraphic time where new events reconfigure not only the whole but also time itself (Colebrook 2009, 26-27). People are also events (Colebrook 2009, 9), and Table 8-5 is a personal narrative explaining Deleuzian time, which Lampert (2009, 90) describes as the "harnessing of the power of non-contemporaneity into the present". Each subsequent separate activity event at a site creates the palimpsest. These moments change the inherent nature of the whole and reconfigure time by presencing those earlier activity events. This concept of time may offer an understanding of enduring ancestral and generational group identities. Brody's (2002 [1981]) ethnographic studies in the Canadian sub-arctic has time as circular based on the seasons for the exploitation of resources and the parallel work of Nelson (1991) who sought to trace behavioural patterns of prehistoric land-use from tool manufacture, use and re-use. My own view is that for the archaeology of the Mesolithic of West Central Scotland the concept of time as circular is as meaningless as time as linear. The coils of a child's slinky toy may be a more suitable metaphor for Deleuzian time as an enchainment of connections.

My first visit at the age of five to the Kelvingrove Art Gallery and Musem was with my grandfather who had previously made many visits with his children, including my father. Trips to the museum were a regular occurrence during my childhood and my grandfather would go on at length about the displays, reading to me the associated legends and later encouraging me to make my own enquiry. What I was unaware of was the start of a family tradition. My wife similarly made many visits to Kelvingrove with her parents and siblings. We would often take our three daughters to the Museum and we would relate tales of our previous visits with their grandaprents and great-grandparents talking not only about what they were looking at but also how the displays had changed over the years. Only one of our daughters now lives in Glasgow. Her sisters when visiting with their children always visit the Museum. When our grandson who lives in Glasgow stays with us to give his parents a well earned rest, his routine on a Sunday morning is to go the Museum. It is usually the first thing he asks at breakfast. When we take him to Kelvingove on a Sunday morning we return as grandchild, child, parent and grandparent.

Table 8-5: A personal narrative to explain the concept of Deleuzian time.

8.6.3 Sedentism in the coastal taskscape of Girvan

The use of the term ‘sedentism’ here does not necessarily infer continuous year round occupation (contra Price and Brown 1985), rather the presence at a specific site for the greater part of the year. Spikins (1999, 72) has commented on the lack of evidence to support coastal sedentism, using the term as defined by Price and Brown (1985), in Britain. A stance offered prior to the publication of Littlehill Bridge (MacGregor and Donnelly 2001) and other sites, e.g. East Barns (Gooder 2007) and Howick, Northumberland (Waddington 2007). It should be noted that during the occupation events the sites of East Barns and Howick would have been further inland from the coast.

Functional perspectives have suggested that sedentism is a result of plentiful local resources, where in the wider region resources are relatively scarce (Kelly 1995, 151-152). The ethnographic evidence from the north-west coast of America shows that the *Yorok*, *Karok* and *Wiyot* harvest resources through fishing, foraging and hunting. To the north, where terrestrial game is less abundant, a greater reliance is necessarily placed on marine resources and these much larger hunter-gatherer groups adopt storage mechanisms, and display a greater degree of intra-group collaboration for subsistence strategies (Schalk 1981; Spikins 1999, 72). The lack of features at Littlehill Bridge may indicate subsistence strategies analogous to the *Yorok*, *Karok* and *Wiyot*. Complementary to these functional perspectives, interpretive approaches have considered more nuanced understandings of sedentism and mobility as vehicles to give meaning to how hunter-gatherers understood their world (Finlayson 2006; Jordan 2006; Section 3.2.5.1).

8.6.3.1 Analogy: the hunter-gatherers of Tierra del Fuego

Tierra del Fuego as an analogy allows the analyst to give consideration to the possibility of contemporaneous hunter-gatherer groups who either engage in the principal sedentary occupation of the coastal margins, or practice an abstract sedentism of mobility based mainly inland. Inferences may be drawn to determine the possibility of similar distinctions from the archaeological record of West Central Scotland.

The oceanic climate of modern day Tierra del Fuego determines that variations between summer and winter are not pronounced. The weather is characterised by year round rain, wind, low temperatures and frequent storm conditions (Briz Godino *et al.* 2011, 126-127). Sea-levels have been relatively stable for the past 6000 years, although over the same period isostatic recovery and tectonics have created raised beaches of 10-11m on parts of Tierra del Fuego coastline. This is analogous to the raised beaches of the Ayrshire coast (Morrison and Hughes 1989, 4), and the Wigtownshire coast where the sunken dwellings of Low Clone South and Barsalloch are situated (Cormack and Coles 1968; Cormack 1970). These littoral habitats were occupied by the *Yamana*, usually within 300m of the shoreline (Orquera and Piana 2009, 63-64). The *Selk'nam* were to be found in the north-east of Tierra del Fuego. The coast comprises lower littoral land levels creating a wide tidal range. This together with large Atlantic breakers restricts *Selk'nam* access to marine resources, impedes coastal settlement culminating in the adaptive practice of different subsistence strategies to the *Yamana* (Orquera 2005; Spikins 2002).

The occupation of Tierra del Fuego by hunter-gatherers may have been as early as 12,000BP (Borrero 1997, 62). The antecedents of the *Yamana* or *Yahgan* occupied the coastal areas of the southern archipelagos of Tierra del Fuego in region of the Beagle Channel to Cape Horn from c.6200BP [c.5100BCE Bronk Ramsey 2011] (Figure 8.20). These hunter-gatherers exploited littoral and marine resources, although they also hunted terrestrial mammals, e.g. guanaco would graze the coastal margins at specific times during the year, usually during the cold season. A wide variety of plant resources would also be harvested (Vidal 1999, 114-116).

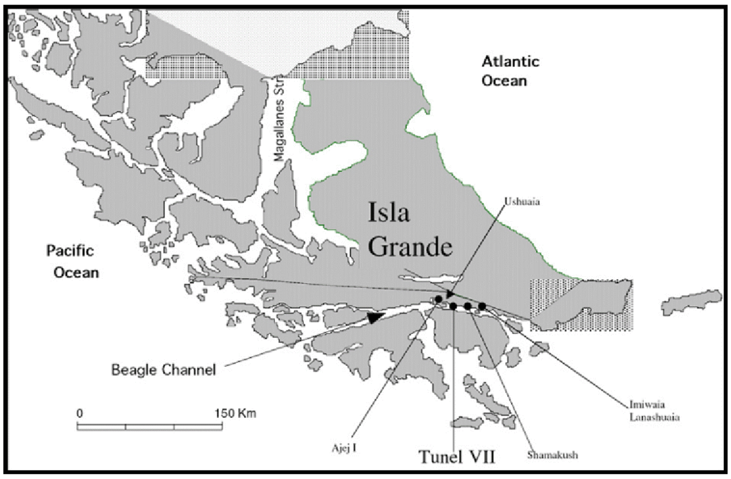

Figure 8.20: Map of Tierra del Fuego at the southern tip of South America showing the main excavated sites on the northern shores of the Beagle Channel (Estévez and Vila 2006, Figure 1). © Authors and ScienceDirect used with permission.

Figure 8.21: Tierra del Fuego coastal settlement of domed branch benders in 1833 taken from Captain R. Fitzroy's voyages of HMS Adventure and Beagle [1839] (Holdgate 1961). © Darwin-online used with permission.

Figure 8.22: In the foreground is the footprint of a *Yamana* sunken dwelling (Hardy and Piqué 2009, Figure 3). © Authors and Antiquity used with permission.

The sunken floor dwellings constructed by the *Yamana* were either domed bender or conical constructions of branches and twigs (Figures 8.21 and 8.22) situated in and in the vicinity of shell middens. Archaeological excavation was undertaken on a *Yamana* dwelling on the north-east coast of the Beagle Channel. Ten distinct occupation episodes were recorded of varying temporal scales, with no evidence to suggest that these episodes were seasonal (Estévez and Vila 2006), i.e. seasonal in the Tierra del Fuego sense of little to distinguish one season from another (Briz Godino *et al*. 2011, 126-127). It was possible to distinguish the variations in the exploitation of food resources indicating that the *Yamana* utilised a wide range of procurement strategies. The dwellings would be rebuilt on the same footprint. Dendrochronology determined that the occupation episodes spanned the late 18th-century to the late 19th-century CE (Estévez and Vila 2006).

The *Selk'nam* also utilised littoral, marine and plant resources, although there was an enhanced focus on the inland hunting of guanaco and other game, including birds (Spikins 2002, 65). There are differences in the built structures of the *Selk'nam* when compared to the *Yamana* dwellings (Chapman 1997; Spikins 2002). Borrero (1997, 73) suggests that the log built conical dwellings were a late development, and can be distinguished from those conical dwellings made with branches (Figure 8.22). The implication is that guanaco skin shelters were the preferred form from the Early Holocene (Figure 8.23). These dwellings would be taken down and rebuilt at the next temporary location.

Figure 8.23: Photograph taken in 1907-08 of a *Selk'nam* family group in front of a guanaco skin shelter (Borrero 1997, Figure 52).

Figure 8.24: Experimental reconstructions of domed and conical branch dwellings (Estévez and Vila 2006, Figure 9). © Authors and ScienceDirect used with permission.

8.6.3.2 The evidence from Littlehill Bridge, Girvan

The proposed development of a new sewage plant necessitated archaeological investigation in this area of known Mesolithic and later prehistoric activity. Littlehill Bridge is 2km north of Girvan. Approximately 500m to the south is Gallow Hill, which in itself is less than 500m north of Girvan Mains Farm. The site is located on the late glacial raised beach at 14m OD, near to the lateral extent of the Holocene maximum marine transgression. The present shoreline is c.400m to the west of the site (MacGregor and Donnelly 2001, 1).

During the Late Mesolithic c.4890BCE, Girvan Mains was a peninsula with a lagoonal embayment inland as far as Enoch Farm at the time of the maximum sea-levels in relation to the land. The Girvan area comprised of lagoonal, estuarine, riverine and marsh habitats [Jardine 1962; 1971; 1975] (cf. Section 2.5). Jardine (1962, 275) summarised the Late Mesolithic environment at Girvan as:

> "...the interplay of estuarine, marsh and marine conditions as the sands and gravels accumulating at the mouth of the Water of Girvan formed at times a continuous barrier, at times a discontinuous series of shoals."

The point has been well made that Girvan would have offered a wide diversity of exploitable resources for hunter-gatherer groups (cf. Morrison and Hughes 1989, 10).

It is, therefore, not surprising that the excavations at Littlehill Bridge revealed one or more scoop features associated with 'bender' structures. These scoops were dug out to create a sunken floor to the structure (Table 2-10; Figure 2.7; MacGregor and Donnelly 2001, 4-6; Wickham-Jones 2004, 235). This parallels the situation at Low Clone South, Wigtownshire (Cormack and Coles 1968). In contrast, the scoop at Barsalloch, Wigtownshire was a naturally occurring hollow feature (Cormack 1970). Both Low Clone South and Barsalloch are coastal sites on the Solway Firth. These 'benders' should not be confused with the more substantial timber post-built structures, albeit with sunken floors, associated with East Barns, East Lothian (Gooder 2007), and Phases 1a, 1b, 2 and 3 at Howick, Northumberland. Phase 2 has been interpreted as being similar in form to East Barns (Waddington *et al.* 2007, 192). 'Benders' with a sunken floor can be found throughout north-western Europe during the Mesolithic period; for example at Nivå in Eastern Denmark (Jensen 2003), on the west coast of Sweden (Hernek 2003), western Norway (Åstveit 2009). Grøn (2003) has compiled the evidence of Mesolithic structures found throughout south Scandinavia, where the majority of dwellings comprise of a range of structures over a sunken floor.

The site at Littlehill Bridge has been interpreted as comprising of one or more structures over a sustained period of intermittent occupations during which a wide range of domestic activities were undertaken. The archaeological deposits continue beyond the confines of the trench which may infer other potential aspects to the phases of the Mesolithic occupations (MacGregor and Donnelly 2001, 11-12). Ethnographic analogy suggests that these structures, assuming they were maintained during periods of occupation, could persist for up to 100 years, and may have been the focus of occupation for many hundreds of years (cf. Section 8.5.4.1; after Estévez and Vila 2006).

A radiocarbon date at 2σ of 6335-6012BCE [6245-6020BCE at 1σ] (Beta-108701 7350±60BP) was obtained from a fragment of burnt hazelnut shell (MacGregor and Donnelly 2001, 11-12), which is not particularly helpful in attempting to determine the chronology of the site. What can be said is that an episode of occupation occurred prior to the maximum marine transgression.

Further fieldwork is essential at Littlehill Bridge to survey and excavate those archaeological features and deposits extending beyond the geographic scope of the excavations undertaken by GUARD in 1994, to obtain additional organic materials for radiocarbon dating to attempt to determine the chronology of occupation, and establish whether or not any of the scoop features are contemporaneous. Cognisant of that caveat, there remains the tantalising possibility of a 'village' of 'bender' structures at Littlehill Bridge.

8.6.3.3 The nature of the coastal occupation of Ayrshire

Littlehill Bridge provides strong evidence for sedentary occupation during the Late Mesolithic period in an area of the Ayrshire with substantial and verifiable Mesolithic activity. The analogy to the *Yamana* is compelling, although not without problems. Firstly, Smith (1895, 222-223) reported a shell midden on the raised beach near the harbour at Ballantrae (Lacaille 1946, 87; 1954, 197). An evaluation undertaken by GUARD in the immediate vicinity of the shell midden found no trace of archaeological features or deposits (Swann 2006, 157). A synthesis of the prehistory of Ayrshire (Morrison and Hughes 1989) makes no reference to this shell midden in the section on the Mesolithic period indicating more than some doubt regarding its provenance as representative of Mesolithic activity. The predominantly dog-whelk midden at Downan, near Ballantrae, associated with several human burials (Moore 1881; Moore and Smith 1885), is unlikely to be Mesolithic and may even relate to historical activities. An oyster shell midden was reported situated on the raised beach at Heston Island, Kirkcudbrightshire. Truckell (1962, 45) suggested that the midden was Mesolithic in character, despite the absence of corroborative or artefactual evidence. A similar shell midden was discovered at Stranraer, Wigtownshire (*ibid*; Childe 1935; Lacaille 1954). Neither of these middens can be categorically ascribed to the Mesolithic period. Secondly, the problems associated with organic preservation in Scotland generally means that artefacts, other than lithics associated with the coast as a task area have not survived. The absence of elongated pebble tools, so common in the 'Obanian' middens is also telling, however, typologically similar tools in organic materials associated with shell middens were recovered at Morton, Fife (Coles 1971). A biserial barbed antler point, typologically similar to an 'Obanian' point from MacArthur Cave (Anderson 1895, Figure 11), was recovered from the River Irvine, Shewalton (Lacaille 1939, 49), and subsequently dated to the Mesolithic period [4910-4540BCE (Beta-73552 5870±70BP)] (Bonsall and Smith 1990, 359).

It is possible that the lagoonal, coastal and estuarine habitats at Girvan determined that either shellfish was not a resource exploited by the hunter-gatherers groups who occupied Littlehill Bridge, or although less likely all the evidence of shell middens may remain undiscovered. There is no known or attestable evidence for the major exploitation of shellfish during the Mesolithic period on the coasts of West Central Scotland and south-west Scotland. The focus during the Late Mesolithic at Littlehill Bridge may have been on fishing, hunting game on the coastal margins and harvesting plant resources. The presence of a diverse range of microliths implies a potentially wider range of task related activities. Carbonised hazelnut shells and seeds were recovered. Edible seed species such as sun spurge, charlock and chickweed are recorded. Palaeobotanical evidence suggests a terrestrial habitat of mixed woodland comprising of oak, hazel, alder and birch with open glades (Miller and Ramsay 2001, 10-11).

The common differences in the profiles of the lithic assemblages from Ballantrae and Girvan may indicate three potential connected or disconnected scenarios for coastal occupation. Firstly, the activities at Ballantrae may represent visits at certain times of the year from those hunter-gatherers groups who occupied Girvan to either supplement resource strategies and/or collect beach pebble flint. Events at the non-midden site at Morton, Fife have been interpreted as related to the collection of raw materials (Coles 1971; 1983a; Deith 1983). Secondly, the absence of evidence for sedentary settlement at Ballantrae may simply represent a bias in discovery and hunter-gatherers groups may have occupied this location on a quasi-permanent basis. If that is the case, it is possible that the sedentary settlements at Ballantrae and Girvan were not contemporaneous with a distance of only 20km between the respective clusters of sites. Thirdly, the activities at Ballantrae may be synonymous with the *Selk'nam*, inland hunter-gatherer groups making occasional visits to exploit the resources of the coastal margins away from those areas of sedentary settlement (after Spikins 2002, 65).

8.6.4 Social boundaries and the nature of inland activities

The mobility of the inland hunter-gatherer groups should not be defined in binary opposition to those sedentary coastal groups. Mobility may be viewed as abstract sedentism with the tent interpreted as a metaphor for the stability of the social dimension and the epi-centre of a social territory (Finlayson 2006; Jordan 2006).

8.6.4.1 Social boundaries

Problems with the efficacy of the notion of either a normative movement cycle/seasonal round or whether there is such a thing have been considered at Section 2.3.2. Current landscape approaches (e.g. Conneller 2000a; Chatterton 2003; Cummings 2003; Jordan 2003) with a principal focus on networks within a meaningful taskscape of connections and disconnections effectively draws in the concept of social boundaries into a broader understanding of the landscape. Even so this does not negate the potential problems of social boundaries as a valid line of academic enquiry. If there was a seasonal round it would probably have been a dynamic social construct with variations effected by hunter-gatherer groups seeking out resources at different locations at different times of the year (cf. Conneller 2008). Variations in the movement cycle would be indicative of Deleuze's third repetition and third syntheses (Table 8-4).

The recognition of social boundaries archaeologically is fraught with problems. Firstly, the mutuality of territorial access among hunter-gatherer groups potentially obfuscates the movement cycle of distinctive networks. There are also problems with establishing a distinctive character to a particular hunter-gatherer group. Ingold (1999) drawing on ethnographic accounts describes the hunter-gatherer network as an open association, where each person is kinship related to one or more people within the group. The group settles on where to go and with whom, which creates independence and intra-dependence among members. The social dimension of the hunter-gatherer group is one of communal focus rather than boundary, which may imply a certain socio-rigidity (Wilson 1988, 50; Ingold 1999, 408). Ethnographies from the temperate coast of western Canada indicate group/band size of 50-60 people within wider open communities of 280 (Layton and O'Hara 2010, Table 5.1). These communities facilitate the movement of people between the constituent groups (*ibid*, 85). It is usual for hunter-gatherer groups to have entitlement, although not absolute claims to resources within their environs (*ibid*, 97). On this basis it is possible to consider variations in raw material procurement strategies as a potential indicator for the characterisation and differentiation of hunter-gatherer groups.

Secondly, the nature of the lithic assemblages as palimpsests representing the conflation of connections and disconnections in the taskscapes, potentially over millennia, also hinders meaningful recognition of social boundaries. Thirdly, until such time as geographic granularity of investigation into the chemical signature of chert is increased then interpretation of the social boundaries of inland hunter-groups must remain conjecture. Fourthly, drawing lines on a map representing the movement cycle during the Mesolithic period can often appear to make sense when viewed from above with hunter-gatherers seeking out resources in the landscape. The difficulty is best summarised by the anthropologist Edward Hall quoted in Wolfe's (1969) *The Pump House Gang*, where the context was a discussion of the social consequences of living in the sink estate of Bedford-Stuyvesant in New York:

> "The planners always show you a bird's eye view of what they are doing. You've seen those scale models. Everyone stands around the table and looks down and says that's great. It never occurs to anyone that they are taking a bird's eye view. In the end, these projects do turn out fine, when viewed from an airplane" (referenced in Leslie 1995, 1).

Reading Finlayson (1989) it is arguable, although not explicit, that he attempted to counteract a number of these problems based on his interpretation that flint at inland sites, representative of a micro-phenomenon, was a time transgressive variant. Brody's (2002) [1981] mapping of hunting territories for the First Peoples of British Columbia determines that travelling distances of 100km and more are not unusual within the movement cycle. Although the sites of Starr 1 and Smittons are less than 15km apart, Finlayson (1989, 201) suggests that the hunter-gatherer groups who occupied Smittons had moved inland from the Solway c.38km due south, and Starr was occupied by people moving inland from the Ayrshire coast. Girvan is c.31km due west of Starr and Loch Doon. This interpretation is largely based on the intensity of the utilisation and availability of flint within the movement cycle, and movement following water courses and routeways from the coast inland. Finlayson is offering a cautious interpretation of social boundaries; unlike either Gendel (1984; 1987; 1989) where the social boundary is defined by the conflation of microlithic attributes to create a profile for comparison across the landscape, or Jacobi (1976) who initially sought to classify social boundaries based on the types of microliths recovered (contra Jacobi 1987).

On the basis that flint is indicative of pioneer incursions (after Finlayson 1989), subsequent events are considered to be related to hunter-gatherers groups forging new group identities (after Larsson 2007). These groups would have been occupying a diverse range inland habitats and locations, except for occasional visits to the coast in their inter-changeable movement cycle (after Conneller 2008). This pre-supposes that coastal sites pre-dated inland sites. The limited evidence from radiocarbon determinations (cf. Section 8.2.3) neither supports nor disproves this view.

The sites at Daer 84, Daer 85 and Daer Reservoir are situated c.75-79km inland from the Ayrshire coast and c.45km from the Solway. It is clear from the raw material components of the assemblages that the occupations can be distinguished. The variation in the chert at Daer 84 and Daer 85 suggests the exploitation of different raw material resources within the Daer Valley, which by implication infers either a minimum of two differentiated hunter-gatherer groups occupying these sites, or a temporal distinction by the same group. The unique composition of the raw materials in the assemblages from Daer Reservoir indicates a potential nodal point for a seriatim occupations by hunter-gatherer groups utilising distinctive raw materials probably from source locations in the

Southern Uplands. It is possible that the people who occupied Daer Reservoir also travelled from the Solway, although potentially different groups exploiting different resources to those who occupied Smittons. If Finlayson (1989, 200-201) is correct about flint being a temporal marker then it is possible that the occupations at Daer Reservoir predated those in the Daer Valley. It is feasible, although it is difficult to say more than that, that the occupations at Daer 84 and Daer 85 were hunter-gatherer groups who travelled inland from the Ayrshire coast to exploit the upland resources of the Daer Valley. Powbrone is c.35km from the Ayrshire coast which may suggest a base for incursions into Avondale.

Weston, and to a lesser degree Climpy, is situated close to the Biggar Gap; a routeway between east and west. It may be that the occupations at Weston and Climpy are the manifestations of hunter-gatherer groups travelling to these locations from either south-east Scotland, or from the coastal areas of the Firth of Forth. The presence of Ordovician chert in the assemblage from Climpy in an area of local Carboniferous chert may suggests movement from an area rich in the former raw material, e.g. East Lothian, West Lothian and Berwickshire (after Owen *et al*. 1999; 1999a).

8.6.4.2 The nature of inland activities

The nature of the inland activities is based on the microlith use-wear analysis undertaken by Finlayson (1989) on the assemblages from Starr, Smittons and Gleann Mor. In full knowledge of the caveats highlighted by Finlayson (1989; cf. Section 7.3.7), it is interesting to consider if there is any patterning in the assemblages when groups are arbitrarily constructed based on the evidence of the percentage frequencies of backed bladelets and scalene triangles from Starr, Smittons and Gleann Mor (Tables 8-6 and 8-7).

The common differences from Daer 85, CTSF, Arran and Smittons suggest a correlation. The incidence of scalene triangles would tentatively place Daer 84, and Weston within the Smittons Group, although the percentage frequency of backed bladelets is considerably higher. The Smittons Group suggests mixed activities incorporating hunting and a wide range of other tasks. The presence of *pièces esquilées* recovered from Daer 84 and Daer 85 indicate activities which may be either associated with, and/or unrelated to hunting.

The common differences for Daer Reservoir and Auchareoch may be said to fit loosely within the Starr Group, although the occurrence of backed bladelets is appreciably higher; the frequency of scalene triangles has broad common differences as the most common microlith type. The occupations in the landscape of Daer Reservoir and Auchareoch may, like Loch Doon, have been principally focused on fishing and plant resources.

Climpy is an assemblage apart associated with retooling of microliths. The incidence of backed bladelets statistically equates to Gleann Mor, the frequency of scalene triangles is substantially higher 72.73%; Gleann Mor 29.05%. None of the microliths from Climpy have evidence of edge damage.

The diversity of microlith types (Figure 7.8) does not provide any justification for the arbitrary groupings. The ratio of convex to thick convex scrapers (Table 7-17) indicates broad common differences between Daer 85 (2.00:1), Daer 84 (2.66:1) and Weston (2.88:1). Unfortunately, there is no detailed analysis of the scrapers from Starr and Smittons, and as the assemblages are now lost there is no chance of any in the future. The corresponding ratios for Daer Reservoir and Gleann Mor are 6.67:1 and 1.17:1, respectively.

	Backed bladelets	Scalene triangles
Starr Group		
Starr 1 & 2	20.51%	38.46%
Daer Reservoir	36.84%	43.61%
Auchareoch, Arran	38.09%	53.74%
Smittons Group		
Smittons	44.44%	25.93%
Daer 85	46.15%	26.15%
Daer 84	66.07%	27.43%
Weston	62.41%	24.40%
CTSF, Arran	30.84%	25.23%
Gleann Mor Group		
Gleann Mor	7.03%	29.05%

Table 8-6: Groupings based on the percentage frequencies of backed bladelets and scalene triangles.

	Total	Backed bladelets	Double backed bladelets	Crescent	Scalene triangle	Triangle	Trapeze	Needle point	Leaf point	Backed point	Rod	Indeterminate
Complete microliths												
Inland: Island												
Auchareoch, Arran	147(7)	56(4)		10	79(3)	2						
CTSA 1, Arran	0											
CTSE, Arran	3(3)	2(2)			1(1)							
CTSF, Arran	107(35)	33(11)		8(4)	27(6)	1		2		12(6)	8(1)	14(6)
WBD, Arran	0											
WBF, Arran	0											
Site 610, Machrie Moor, Arran	6	1		2	3							
24/01 Machrie Moor, Arran	2	1			1							
10/4 Tormore, Arran	1							1				
Inland: Mainland												3
Woodend Loch, South Lanarkshire	10	2			4	1						
Glentaggart, South Lanarkshire	1				1							
Howburn, South Lanarkshire	2				2							
Smittons	19	8		2	7	1		1				
Starr 1, South Ayrshire	17	3		2	10		1	1				
Starr 2, South Ayrshire	10	5			5							
Coastal: Mainland												1
Warehouse 37, Girvan	5	2			1			1				
Gallow Hill, Girvan	12	4		2	4						2	
Littlehill Bridge, Girvan	3	1			1					1		
Turnberry	3			1	2							
Grants HQ, Girvan	0											
Garleffin, Ballantrae	0											

Table 8-7: Complete microliths from excavated assemblages by type. Figures in parenthesis represent the number of pitchstone artefacts.

The events at Daer Reservoir may be compared to the sites from Waun Fignen Felen in South Wales. There are broad common differences in the upland locations for these sites (cf. Section 4.6.2; Table 8-8). Known events at Waun Fignen Felen cover four millennia and three millennia at Daer Reservoir, what Schlanger (1992, 97) described as persistent places. The assemblages represent palimpsests of activities. The distinction of Early Mesolithic sites based on the presence of broad blade microliths and larger oblique truncations, together with radiocarbon determinations falls with the English model. The radiocarbon dates from Daer Reservoir 2 and Daer Reservoir 3 correspond to the Late Mesolithic period (Table 8-1).

All of the microlithic forms from Daer Reservoir are narrow blades. There were no oblique truncations recovered from Daer Reservoir. However, the 20 oblique truncations from Weston are similarly narrow blade forms, with a maximum width of 8mm; average 5.15mm and mode 5mm. The position is more complicated for the coastal sites. 35.71% of oblique truncations from Ballantrae have a width greater than 8mm, which is the arbitrary marker to distinguish narrow and broad blades (after Zetterlund 1990, 73); Girvan 41.67%. In contrast, all of the microliths from Ballantrae and Girvan are narrow blade forms and only one scalene triangle has a width greater than 8mm at 9mm. The evidence from West Central Scotland is anomalous to the English model.

As previously noted narrow blade microlithic assemblages in Scotland predate those known in England and fall with the Early Mesolithic period of the English model (Saville 2008; Lawson 2001). Neither this English model nor the time transgressive changes in the form of microliths seen in mainland north-west Europe (e.g. Kozlowski 1977; Rozoy 1978) fit within the wider corpus of material from Scotland (cf. Section 9.3).

The narrow blade assemblages comprise of scalene triangles and backed bladelets. Waun Fignen Felen like Daer Reservoir fits within the Starr Group, implying a focus on fishing and the exploitation of plant resources. This contradicts the notion that the events at Waun Fignen Felen were hunting related (cf. Barton *et al.* 1995, 107-109), although it must be said that homogeneity must not be categorically read into task related strategies adopted in South Wales and West Central Scotland during the Mesolithic period.

The dominance of beach pebble flint at Waun Fignen Felen is not seen at Daer Reservoir where the most common raw material is Radiolarian chert, although flint is preferred for the manufacture of microliths. Where Cretaceous chert moves inland from the coast of South Wales, Radiolarian chert is readily available in the Southern Upland within a few kilometres due south of the Daer Valley. The complementary use of locally resourced Carboniferous chert during the Late Mesolithic is noted at Climpy and Powbrone. The raw materials used at Waun Fignen Felen are not as distinctive as those at Daer Reservoir, which appears to be exceptional in the context of West Central Scotland. However, both locations appear to have ancestral and cosmological significance. Where it may have been obligatory to utilise certain raw materials for events in Daer Reservoir potentially cross-cutting hunter-gatherer groups, it is possible that something similar is being seen at Waun Fignen Felen. The focus on the utilisation of beach pebble resources across four millennia may infer cosmological reference to the ancestors who first made inland incursions and the personhood of the sea, although it is equally possible that raw materials were imported from the coast because of the poor quality of Carboniferous chert. If hunter-gatherer groups in South Wales were either coastal or inland based, it is possible that littoral flint and chert may have been either collected on raw material foraging visits to the coast (e.g. Deith 1983), or represents commodity exchange with coastal groups (cf. Finlayson 1989) who may have been part of a wider community sharing similar belief systems and common ancestors (after Layton and O'Hara 2010).

The Mesolithic sites of Waun Fignen Felen, Black Mountains, South Wales (Barton *et al.* 1995) 12 lithic scatters and 54 other sites have been recorded at c.485m OD at Waun Figlen Felen in a lake basin of the Taw Valley in the Black Mountains demarcating the extreme western end of the Brecon Beacons. The lake basin now comprises of a bog with peat overburden draining into the River Tawe. The sites are distinguished between the Early and Late Mesolithic based on the English model, although no burins, adzes or axes were recovered from the dated Early Mesolithic contexts. Radiocarbon dates at 2σ for the Early Mesolithic range from 10320-9250BCE (CAR-362 10180±110BP) to 8040-7690BCE (OxA-2247 8850±80BP); Late Mesolithic from 7270-6690BCE (OxA-1497 8070±80BP) to 6430-6120BCE (CAR-690 7460±90BP). The artefacts comprise in the main of three different raw materials. Firstly, Cretaceous flint is most common and is found in Early and Late Mesolithic contexts. The raw material most likely derives from beach pebble resources. The nearest location from which to collect beach pebble flint is a distance of 29km. Secondly, the cortical surface of Cretaceous chert also recovered from Early and Late Mesolithic sites infers either the utilisation of beach resources, the nearest location is 50km distant, and either glacial gravels or a primary geological resource. Thirdly, Carboniferous chert mainly features in Late Mesolithic contexts and was locally resourced.

Table 8-8: Summary of Waun Fignen Felen (Barton *et al.* 1995).

8.7 Distinguishing being and becoming: regional profile and intra-regional variation

The work undertaken for this thesis determines that the regional profile of West Central Scotland during the Mesolithic period is constructed based on the homogeneity and continuation of technological practice as a macro-phenomenon as being. The principal common differences in technological practice across the region are shown at Table 8-9.

Regional profile: common differences of technological practice

- The contemporaneous and complementary use of bipolar and platform reduction strategies;
- Use of simple platforms for bipolar and platform reduction;
- Preference for the use of a softer hammerstone;
- Presence of blade industries;
- Proximal profile of blades and possible use of blade segments for retooling;
- Form of microlithic retouch; and
- Mean length of microliths.

Table 8-9: Principal common differences in technological practice establishing a regional profile.

The region has three distinct intra-regional zones highlighting variation in becoming. The coastal assemblages of Ballantrae and Girvan can be distinguished by the statistically exclusive utilisation of pebble flint as a raw material, and the primary knapping of material at secondary locations. Another factor is the relative scarcity of microliths in the collections and assemblages, which may imply either a principal focus on tasks undertaken unrelated to microlith production and use, or may represent different temporal episodic events. The recovery of pebble flint from the inland sites of the mainland and Arran may represent pioneer incursions. The subsequent use of chert on the mainland and pitchstone on Arran may signify the forging of new identities in the taskscapes of the later millennia of the Mesolithic period in West Central Scotland. The percentage frequencies of microliths from the Arran (e.g. Affleck *et al*. 1988; Donnelly and Finlay nd.) and *SHMP* (Finlay *et al*. 2000a) sites provides further evidence for common differences with the mainland inland sites. The vexing question is does the use of pitchstone demarcate an intra-regional variation? It may be argued that the use of pitchstone forges new identities similar to the use of chert on the mainland. If the events on Arran as understood are a microcosm of activities similar to the mainland, then the islands of the Firth of Clyde may be said to form part of that regional distinction. However, the utilisation of pitchstone during the Mesolithic period, which is not seen on the mainland until the Early Neolithic (after Ballin 2009), must set Arran apart as a distinct intra-region.

The site sampling strategy determines that the major focus on variation must be in the comparison between the mainland coastal and inland sites. Inter-site variation at the coast is noted in the lagoonal habitat and the evidence for sedentary occupation at Girvan, and the conceptual variation in the lateralisation and other attributes of notch and snap truncations between Ballantrae and Girvan. Intra-regional variation is recorded in the differences in the frequencies of blade and non-specific platform cores, where other than Weston there is a great degree of inter-changeability of cores for flake and blade production at Ballantrae and Girvan. Other than Powbrone, there is a regional pattern in the mean length of flint blades, which contrasts to platform flake production where there are distinct inter-regional preferences. The average length of platform flakes indicates the preference for longer secondary and tertiary flakes at coastal sites.

At the inland sites there are common differences for *in situ* knapping and core rejuvenation strategies. Opened material and/or pre-formed cores being brought to activity areas are a feature of the inland sites. The exception is in the predominantly bipolar reduction of quartzite at Powbrone. Inter-site variability is most noticeable in raw materials. For example, the complementary use of quartz at Loch Doon, the distinctive bluish-grey colour hues of the chert and chalcedony and the siliceous blue stone at Daer Reservoir. Differences are recorded in the use of Ordovician chert and Carboniferous chert. Both forms were recovered from Climpy. The variation in the cortical surface of chert indicates different source locations, procurement strategies and temporal events at inter-site and intra-site scales of enquiry, e.g. Daer 84 and Daer 85.

There is a greater diversity of tool forms at the coastal sites. There is evidence for the manufacture of microliths at all sites other than Climpy and Powbrone; although Loch Doon should be similarly distinguished it is not included because of the microlithic component from the excavations at the Starr sites (after Finlayson 1989). Climpy stands apart because it is the only site where retooling was undertaken without microlith manufacture.

Intra-regional and inter-site variations are noted in the numerical frequency and diversity of different types of microliths. The microlithic sites, other than Climpy, broadly fit into categories of task differentiation based on Finlayson's use-wear of microliths from Starr 1, Starr 2 and Smittons.

A broad range of scraper types were recovered from the coastal and inland collections and assemblages. Once again, Climpy is the exception. Convex forms are most common. The ratio of convex to thick convex is greatest at Daer Reservoir and Loch Doon which may imply task differentiation where sites are in the vicinity of larger bodies of water. Finlayson (1989, 204) suggested the activities at Starr related to a broad array of tasks of which fishing and the harvesting of plant resources may have been prominent.

8.8 Summary

Progress is being made with additions to the radiocarbon database, however, more than two decades on from Woodman (1989) the chronology of the Mesolithic remains elusive. It could be argued that it is not only inadequate at a national or regional basis but also at a site level where the nature of the resource is predominantly palimpsests, where one radiocarbon date may indicate only one of many different temporal events. The chronology of the Mesolithic may remain a desire but may be outwith practical reach.

The regional and intra-regional variation for West Central Scotland mirrors the continuity of technological practice, which is also noted in inter-site and intra-site variations as macro and micro-phenomena. The micro-scale of enquiry constructs common differences and variations in practice from which it is possible to recognise intra-regional difference (Figure 8.25). The regional profile is dependent upon the efficacy of the methodology in setting down the geographical parameters. The use of watersheds enables the analyst to confront the same topographic features as the hunter-gatherers of the Mesolithic period; on foot we may be able see the same barriers and routeways across the landscape, although our view of the landscape is not of a mixed woodland but sparse of trees except for industrial afforestation. It is on this basis that watersheds probably present the best basis to meaningfully contract regions in mainland Scotland (cf. Hughes 1991; Spikins 1999).

Understanding technology as embodied (after Deleuze 2004 [1968]) where in the trajectory of the social dimension things are given meaning as detached parts of people; subject and object as inter-changeable and inseparable (after Gosden and Marshall 1999a). In many respects it is those first stages of the *chaîne opératoire* that is the kernel from which understanding flows. The agency of technological practice as performance (after Shankar 2006) creates an expression of being as a macro-phenomenon, but is only recognisable as variation from moments as a spatial mnemonic (after Gatewood 1985) of micro-phenomena, which is the key to seeking out identity and group identities through procurement strategies and raw material choices (after Deleuze 2005 [1968]). For my part, I do not believe that raw material choice is simply embedded within the movement cycle, although that does remain a possibility. Preference is given to an understanding of these choices as proscribed through cosmologies and the spirituality and materiality of stone and an elemental world of personhood (after Stout 2002; Taçon 1991; Cumming 2003). The movement of hunter-gatherer groups corresponds to the forging of new taskscapes and new identities (after Larsson 2007; after Ingold 1993 [2000]; after Conneller 2000a; Burke and Stets 1999; Stets and Burke 2000; Kim 1990). People as technology created connections and disconnections that inscribed the landscape creating the inseparable nature of all aspects of Mesolithic lifeways.

Variation at intra-regional, inter-site and intra-site scales of enquiry allow the analyst to consider notions of task differentiation, the nature of occupation and of pioneer incursions, based on flint as a predominantly coastal resource, as people moved inland from the coasts (after Finlayson 1989). Ethnographic analogy asks us to consider the possibility of different hunter-gatherer groups occupying coastal and inland habitats. The evidence from Littlehill Bridge speaks to the sedentary occupation of the lagoonal environments of Girvan during the Late Mesolithic. Following Finlayson (1989), the use of flint at inland locations as a signifier of pioneer advancements inland from the coastal margins is preferred. I find the analogy to the *Yamana* and *Selk'nam* of Tierra del Fuego compelling, and favour an interpretation of differentiated lineages of hunter-gatherer groups who chose to predominantly create their taskscapes at either coastal or inland locations.

In conclusion, firstly the *chaîne opératoire* demonstrates the continuity of technological practice across the greater part of the Mesolithic period. Secondly, the scales of variation in West Central Scotland are understood through the *chaîne opératoire* in terms of an embodied technology where people and things are both subject and object within the social dimension, inscribing the landscape and creating the taskscape (after Deleuze 2004 [1968]; after Gosden and Marshall 1999a; after Conneller 2000a). Thirdly, where things can be considered as the detached parts of people, the *chaîne opératoire* and the theoretical constructs of repetition, variation and becoming reinforce the importance of the social dimension and permit meaningful enquiry into identity, group identities and social boundaries. Fourthly, the use of ethnographic analogy drawing in notions of personhood and materiality facilitates an interpretation of the possible cosmological aspects of becoming in the Mesolithic period.

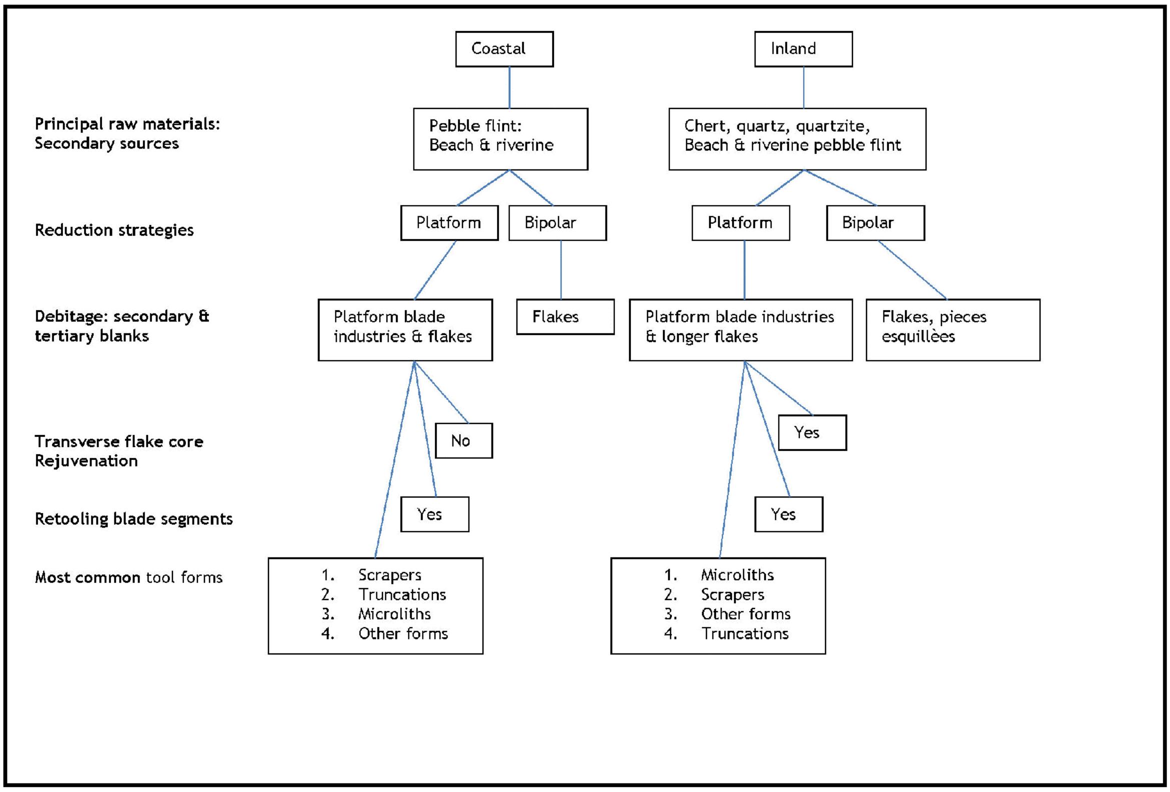

Figure 8.25: Simplified and abridged *chaîne opératoire* highlighting principal common differences and aspects of variation between coastal and inland assemblages.

Chapter 9: Conclusion and future potential

9.1 Introduction

This thesis has offered a regional profile for West Central Scotland during the Mesolithic period, comprising not only of mainland coastal and inland distinctions, but it has explored the efficacy of determining intra-regional status for the islands of the Firth of Clyde.

This concluding chapter will present a synthesis of the salient points from each of the foregoing chapters, representing an overview of the thesis. Secondly, the archaeology of West Central Scotland will be placed within the wider Mesolithic debates in Scotland and north-west Europe. Thirdly, future potentials arising out of this research will be explored.

9.2 Exploring repetition, difference and becoming

Chapter 1 apart from setting out the research aims, context and methods establishes the regional geographic integrity of West Central Scotland for the purposes of my research. A thematic review of the Mesolithic period in Scotland is the focus for Chapter 2. The review proves the validity and efficacy of the research aims and objectives. There are two further issues. Firstly, the paucity of radiocarbon dates determines that the chronology of the Mesolithic period in Scotland at national, regional and site levels of enquiry remains elusive and may be beyond practicable resolution. Secondly, if it was not for the amateur archaeologist undertaking surface collections and the self-motivated community archaeology projects the distribution map of known and attestable Mesolithic events would be much diminished.

The theoretical structure to the thesis combines the two principal themes of variation and technology that are folded into a cohesive framework by reference to the philosophies of Gilles Deleuze. His concepts of repetition, difference and becoming (Deleuze 2004 [1968]) have given meaning and understanding to variation as something more profound than a mere contradiction (Derrida 2001, 192-193). Because I have been engaged mainly with the technological analysis of lithic assemblages I have recast these constructs to incorporate the *chaîne opératoire*. By conjoining these themes of variation and technology, I would argue that the structure has allowed me to understand that it is people and things as technology that inscribe the landscape that creates a meaningful taskscape (after Deleuze 2004 [1968] and Gosden and Marshall 1999). The historiography of technology from the Enlightenment is particularly important. It shows the progress in the academic appreciation of the meaning of technology, and demonstrates that the introduction of Deleuzian philosophy simply takes the cadence of understanding a little further. The interpretation of differentiated hunter-gatherer groups predominantly occupying either coastal or inland locations is derived in the concept of becoming (after Deleuze 2004 [1968]). This is represented in the creation and forging of new identities from the disparate choices in raw material procurement strategies across the inland landscape of South Ayrshire and South Lanarkshire, in comparison to the coastal identities marked by the statistically exclusive use of littoral beach and riverine pebble flint.

Chapter 4 demonstrates the effectiveness of the research transect and highlights coastal and inland assemblages/collections, including control sites outwith the transect, which form the basis for the regional profile of West Central Scotland. The methodological research framework (Finlayson *et al*. 1996; 2000; Finlay 2009; Madsen 1992) for the typological and technological analysis of those assemblages comprised within this study has allowed for the meaningful presentation of the typological and technological data (chapters 5 to 7) to establish the continuity of technical practice, as a macro-phenomenon, for the greater part of the *longue durée* of the Mesolithic period. The accent on the fine granularity of attribute analysis has permitted the recognition of variation, from artefacts as micro-phenomena, at intra-regional, inter-site and intra-site scales of enquiry.

The integration of the variation in data with the theoretical structure gives meaning to variation through repetition in the transformations of becoming. This is further developed by reference to landscape studies incorporating the *chaîne opératoire*, and the redefinition of Ingold's taskscape to include rhizomatics (Conneller 2000a; Deleuze and Guattari 2004 [1972]. This coupled with insight from Finlayson (2006) and Jordan (2006) has allowed an appreciation of how hunter-gatherers avowed and reasserted their becoming in the world as they moved across the landscape. These constructs and the judicious use of ethnographic analogy have permitted me to explore notions of differentiated social boundaries and offer an interpretation into aspects of the cosmology of hunter-gatherer groups of West Central Scotland.

Based on the archaeological evidence of differences in raw materials and technological choices, the weave of structure and methodology has facilitated enquiry and understandings of becoming through variation for identity, group identities, activities, social boundaries, settlement practice and all aspects of regionality.

9.3 Placing West Central Scotland within wider debates

My research in constructing a regional profile for West Central Scotland may sit aside other regional studies, e.g. *SHMP* (Mithen 2000) and *SFS* (Hardy and Wickham-Jones 2007). These studies together with site based projects, e.g. Wickham-Jones 1990; Wickham-Jones and Hardy 2004; Pannett and Baines 2006 and others) confirms the continuity of technological practice for the most of the Mesolithic period.

The time transgressive changes in microlith forms evident in the mainland of north-west Europe (e.g. Kozlowski 1977; Rozoy 1978) are not seen in West Central Scotland or in Scotland generally. The study also further demonstrates the problems associated with attempting to impose the Early Mesolithic/Late Mesolithic English model on the archaeological record in Scotland (cf. Finlay *et al*. 2003). Broad blade microliths have been recovered from Scottish sites (e.g. Ballin 2004; Ballin *et al*. 2010; Hardy *et al*. forthcoming; Saville and Wickham-Jones 2010 and others), however, none have been found with the suite of other tool forms fossilised as the Early Mesolithic in England. One such tool form is the larger broad blade oblique truncation. These artefacts are noted in the coastal surface collections in Ayrshire, although all of microliths and the majority of the oblique truncations are narrow blade forms. The evidence from blade production lends further weight to the overwhelming dominance of narrow blade technology. These broad blade oblique truncations are not seen at the inland assemblages. Currently it is known that narrow blade microlith assemblages occur in Scotland before they appear in England (Saville 2008). For my part, I believe the attempted imposition of the English model in Scotland is representative of a top-down approach and is, therefore, fundamentally flawed. Interpretation must come from the theoretically informed detailed technological analysis of the variation in moments through repetition.

Mesolithic lifeways in Scotland may have certain common differences with our nearest neighbours and north-west Europe, however, it is variation as becoming that sets Scotland apart.

9.4 Future potential

9.4.1 Repetition

It may be said that my research as a synthesis repeats the basis of the work carried out and currently ongoing elsewhere in Scotland in the construction of regional profiles (Mithen 2000; Hardy and Wickham-Jones 2007; Mithen nd.). It is hoped that further regional studies are undertaken. The potential difficulties are at least three-fold. Firstly, there may be problems in the definition of a meaningful geographic region on which to base a study. Secondly, the extent of the corpus of material within the study area, whether available in existing collections or emanating from new research projects, must be of a scale to permit sustainable interpretations at a regional level of enquiry. Thirdly, the study must be theoretically informed.

Repetition can also inferred in the tasks undertaken by people engaged in the ongoing surface collection of lithics often through self-motivated community archaeology projects, e.g. BAG. These resources comprising of surface collections and excavated assemblages are generally ignored by academics. My research has sought to commence the redress of this failing. Further work needs to be undertaken in this regard to integrate the findings into the mainstream of Mesolithic research in Scotland through publication.

9.4.2 Variation

The regional study highlights variation in aspects of Mesolithic lifeways at intra-regional, inter-site and intra-site scales of enquiry. The corpus of regional studies permits the investigation of inter-regional variation highlighting common differences and differences in raw materials and technological choices.

The methodological research framework used by analysts is crucial to facilitate comparanda. The lack of an academic standard for the technological analysis of lithic assemblages is disturbing, especially considering the most comprehensive schema for analysis and related terminologies is readily available, i.e. Finlayson *et al.* 2000; Finlay 2009. The inability to compare your data with the work of other analysts in a more nuanced way other than typological classification is deeply frustrating and denies the potential for the recognition of variation of micro-phenomena. There will be no easy solution to this problem, however, Archaeology Departments in Universities must take the lead in the training of analysts.

9.4.3 Becoming

Theoretical structures are necessarily context specific and designed to deal with the research aims and objectives, and as such will vary from one project to another. The efficacy of the theoretical structure permits giving meaning and understanding to variation and offering an interpretation into Mesolithic lifeways as becoming.

The variation in theoretical agendas potentially allows analysts to see and compare different approaches to becoming at varying scales of enquiry, i.e. at inter-regional, regional, intra-regional, inter-site and intra-site levels. The nexus of differentiated interpretive structures may theoretically inform and impact upon previous studies resulting in reappraisal, and facilitate the formulation of structures for future work.

Becoming for Deleuze (2004 [1968]; Stagoll 2010) is a dynamic that is always in the middle; the transformation of variation into becoming different. This may be an appropriate metaphor for our current understanding of Mesolithic lifeways in Scotland.

This regional profile of the Mesolithic of West Central Scotland will be valuable as a resource for comparanda with other regional studies, and may serve as a template for undertaking future regional syntheses. The theoretical approach adopted should have relevance to alternate material culture datasets across other archaeological epochs.

Appendix I: Attribute tables for analysis of primary technology at inland sites (Chapter 6)

10.1 Tables

10.1.1 Bipolar core attributes

	Climpy	%	Daer 84	%	Daer 85	%	Powbrone	%	Daer Reservoir	%	Loch Doon	%	Weston	%
Raw Material														
Chert	4	100%	16	94.12%	21	95.45%	43	66.15%	2	33.33%			2	100%
Flint			1	5.88%			6	9.23%	3	50.00%	2	100%		
Quartz							2	3.08%						
Quartzite							13	20.00%						
Chalcedony									1	16.67%				
Mudstone							1	1.54%						
Siltstone					1	4.55%								
Total:	4	100%	17	100%	22	100%	65	100%	6	100%	2	100%	2	100%
Bulb														
Pronounced			5	29.41%	4	18.18%	16	24.62%						
Diffuse	4	100%	12	70.59%	18	71.82%	49	75.38%	6	100%	2	100%	2	100%
Percentage of Platform Area														
< or 25%			1	5.88%			3	4.62%						
c.50%			6	35.29%	4	18.18%	14	21.54%			1	50.00%		
c,75%	2	50.00%	7	41.18%	4	18.18%	18	27.69%	3	50.00%	1	50.00%	1	50.00%
100%	2	50.00%	2	17.65%	14	63.64%	30	46.15%	3	50.00%			1	50.00%
Reasons for Abandonment														
Indeterminate							1	1.54%	2	33.33%				
Size	1	25.00%			1	4.55%	11	16.92%			1	50.00%		
Flaws	1	25.00%	1	5.88%	1	4.55%	2	3.08%						
Overshot														
Stepping & hinging	1	25.00%			1	4.55%	3	4.62%						
Angle			4	23.53%	2	9.09%	14	21.54%						
Angle & stepping & hinging	1	25.00%	12	70.59%	17	77.27%	34	52.30%	4	66.67%	1	50.00%	2	100%
Number of Visible Platforms														
Indeterminate							1	1.54%						
1			1	5.88%	1	4.55%	8	12.31%	1	16.67%			1	50.00%
2	2	50.00%	9	52.94%	5	22.73%	17	26.15%	2	33.33%	1	50.00%	1	50.00%
3	2	50.00%	2	11.77%	3	13.64%	21	32.31%	1	16.67%				
4			5	29.41%	8	36.36%	13	20.00%	2	33.33%	1	50.00%		
5					4	18.18%	5	7.69%						
6					1	4.54%								

Table 10-1: Attribute analysis of bipolar cores.

	Climpy	%	Daer 84	%	Daer 85	%	Powbrone	%	Daer Reservoir	%	Loch Doon	%	Weston	%
Platform Stage Analysis														
1	1	25.00%	3	17.65%	1	4.54%	4	6.15%					1	50.00%
2	1	25.00%	5	29.41%	4	18.18%	14	21.54%	2	33.33%				
3	2	50.00%	5	29.41%	4	18.18%	23	35.38%	1	16.67%	1	50.00%	1	50.00%
4			4	23.53%	7	31.83%	14	21.54%	2	33.33%				
5					6	27.27%	9	13.85%	1	16.67%	1	50.00%		
6							1	1.54%						
Predominant Removal														
Indeterminate	2	50.00%	1	5.88%	3	13.64%	4	6.15%	2	33.33%			1	50.00%
Flake	2	50.00%	12	70.59%	18	71.82%	46	70.78%	1	16.67%	2	100%	1	50.00%
Blade			3	17.65%	1	4.54%	5	7.69%	2	33.33%				
Mixed			1	5.88%			10	15.38%	1	16.67%				
Number of Scars														
Average	8		6.7		8.5		6.2		12		11		12	
1-3			4	23.53%	1	4.55%	6	9.23%						
4-6			5	29.41%	4	18.18%	27	41.54%	1	16.67%				
7-9	2	100%	4	23.53%	10	45.45%	25	38.46%	1	16.67%	1	50.00%	1	50.00%
10-12			4	23.53%	5	22.73%	7	10.77%						
13-15					2	9.09%			2	33.33%	1	50.00%		
16-18									2	33.33%				
19-21													1	50.00%
Original Pebble Size														
Indeterminate	2	50.00%	6	35.29%	14	63.64%	41	63.07%	5	83.33%			2	100%
Small		50.00%					3	4.62%	1	16.67%	1	50.00%		
Medium	2		11	64.71%	8	36.36%	16	24.62%			1	50.00%		
Large							5	7.69%						
Angularity/Sphericity														
Indeterminate	3	75.00%	7	41.18%	14	63.64%	24	36.92%	5	83.33%			2	100%
Angular	1	25.00%	8	47.06%	2	9.09%	22	33.85%						
Sub-angular			1	5.88%	2	9.09%	4	6.15%	1	16.67%				
Sub-rounded			1	5.88%	4	18.18%	7	10.77%			2	100%		
Rounded							8	12.31%						
Cortex Type														
Absent	2	50.00%	3	17.65%	12	54.55%	17	26.15%	17	26.15%				
Smooth/chalky			5	29.41%	7	31.82%	2	3.08%	2	3.08%	1	50.00%		
Smooth/hard	2	50.00%	6	35.29%	3	13.63%	35	53.85%	35	53.85%			2	100%
Pitted/heavily pitted			3	17.65%			11	16.92%	11	16.92%	1	50.00%		

Table 10-2: Continuation of the attribute analysis of bipolar cores.

10.1.2 Size dimensions of bipolar cores

Daer 84 (n=17)				**Daer 85 (n=22)**			
			Th				**Th**
Chert (n=16)	**L mm**	**Wmm**	**mm**	**Chert (n=21)**	**L mm**	**Wmm**	**mm**
Maximum	44	32	27	Maximum	41	35	30
Minimum	22	17	13	Minimum	21	13	8
Average	29.5	24.19	16.13	Average	28.43	25.19	17
STDEV	7.7	4.59	4.76	STDEV	5.29	5.57	5.99
Mode	30	20	18	Mode	31	28	14
			Th				**Th**
Flint (n=1)	**L mm**	**Wmm**	**mm**	**Siltstone (n=1)**	**L mm**	**Wmm**	**mm**
Maximum	18	18	12	Maximum	22	24	22
Minimum	18	18	12	Minimum	22	24	22
Average	18	18	12	Average	22	24	22
Mode	18	18	12	Mode	22	24	22
Daer Reservoir (n=6)				**Powbrone (n=65)**			
		W	**Th**			**W**	**Th**
Chert (n=2)	**L mm**	**mm**	**mm**	**Chert (n=43)**	**L mm**	**mm**	**mm**
Maximum	31	27	23	Maximum	38	39	27
Minimum	19	13	8	Minimum	12	12	7
Average	25	20	15.5	Average	23.95	21.37	13.42
STDEV	8.49	9.9	10.61	STDEV	6.54	7.04	5.05
Mode				Mode	21	15	9
		W	**Th**			**W**	**Th**
Flint (n=3)	**L mm**	**mm**	**mm**	**Flint (n=6)**	**L mm**	**mm**	**mm**
Maximum	30	30	20	Maximum	39	45	21
Minimum	24	24	16	Minimum	16	11	6
Average	27.33	27.33	17.67	Average	24	22.33	13.5
STDEV	3.05	3.05	2.08	STDEV	8.22	12.32	6.12
Mode				Mode			
		W	**Th**			**W**	**Th**
Chalcedony (n=1)	**L mm**	**mm**	**mm**	**Quartzite (n=13)**	**L mm**	**mm**	**mm**
Maximum	12	13	9	Maximum	43	71	43
Minimum	12	13	9	Minimum	15	13	6
Average	12	13	9	Average	30.77	34.77	19.38
Mode	12	13	9	STDEV	9.1	17.43	9.87
Loch Doon (n=2)				Mode		22	19
		W	**Th**			**W**	**Th**
Flint (n=2)	**L mm**	**mm**	**mm**	**Quartz (n=2)**	**L mm**	**mm**	**mm**
Maximum	32	20	16	Maximum	43	38	18
Minimum	21	16	14	Minimum	24	24	14
Average	26.5	18	15	Average	33.5	31	16
STDEV	7.78	2.83	1.41	STDEV	13.44	9.9	2.83
						W	**Th**
Weston (n=2)				**Mudstone (n=1)**	**L mm**	**mm**	**mm**
		W	**Th**				
Chert (n=2)	**L mm**	**mm**	**mm**	Maximum	30	32	29
Maximum	26	27	16	Minimum	30	32	29
Minimum	19	17	16	Average	30	32	29
Average	22.5	22	16	Mode	30	32	29
STDEV	4.95	7.07		**Climpy (n=4)**			
						W	**Th**
Mode			16	**Chert (n=4)**	**L mm**	**mm**	**mm**
				Maximum	33	24	16
				Minimum	16	11	5
				Average	23.75	19.75	9.5
				STDEV	7.04	6.13	4.65
				Mode		24	

Table 10-3: Size dimensions of bipolar cores.

10.1.3 Platform core attributes

	Climpy	%	Daer 84	%	Daer 85	%	Powbrone	%	Daer Reservoir	%	Loch Doon	%	Weston	%
Raw Material														
Chert	11	100%	41	97.62%	35	97.22%	8	47.07%	19	36.54%	16	39.02%	84	94.38%
Flint			1	2.38%			4	23.53%	29	55.77%	22	53.66%	5	5.62%
Quartz							1	5.88%						
Agate							2	11.76%						
Chalcedony									3	5.77%	2	4.88%		
Jasper							1	5.88%						
Siltstone					1	2.78%			1	1.92%	1	2.44%		
Indeterminate							1	5.88%						
Total:	11	100%	42	100%	36	100%	17	100%	52	100%	41	100%	89	100%
Bulb														
Absent	1	9.09%			1	2.78%	1	5.88%	2	3.85%				
Pronounced			5	11.90%	4	11.11%	2	11.76%	2	3.85%				
Diffuse	10	90.91%	37	88.10%	31	86.11%	14	82.36%	48	92.30%	41	100%	89	100%
Percentage of Platform Area														
< or 25%			5	11.90%			1	5.88%	5	9.62%	5	12.20%	2	2.25%
c.50%			17	40.48%	8	22.22%	7	41.18%	10	19.23%	11	26.83%	14	15.73%
c,75%	5	45.45%	8	19.05%	17	47.20%	3	17.65%	22	42.31%	11	26.83%	44	49.44%
100%	6	54.55%	12	28.57%	11	30.56%	6	35.29%	15	28.84%	14	34.14%	29	32.58%
Reasons for Abandonment														
Indeterminate			2	4.76%	1	2.78%					1	2.44%	4	4.49%
Size	3	27.27%	4	9.52%	3	8.33%	6	35.29%	7	13.46%	7	17.07%	28	31.46%
Flaws	3	27.27%	1	2.38%					6	11.54%				
Stepping & hinging	5	45.46%	5	11.91%					6	11.54%	7	17.07%	7	7.87%
Angle			4	9.52%	11	30.56%	4	23.53%	8	15.38%	4	9.76%	7	7.87%
Angle & stepping & hinging			26	61.91%	21	58.33%	7	41.18%	25	48.08%	22	53.66%	43	48.31%
Number of Visible Platforms														
1	1	9.09%	13	30.95%	3	8.33%	4	23.53%	10	19.23%	11	26.83%	25	28.09%
2	5	45.45%	15	35.71%	16	44.45%	7	41.18%	24	46.16%	24	58.53%	37	41.57%
3	4	36.37%	9	21.43%	13	36.11%	4	23.53%	15	28.84%	2	4.88%	17	19.10%
4	1	9.09%	4	9.53%	3	8.33%	2	11.76%	3	5.77%	4	9.76%	10	11.24%
5			1	2.38%	1	2.78%								
Platform Stage Analysis														
1	1	9.09%	14	33.33%	1	2.78%	4	23.53%	10	19.23%	8	19.51%	26	29.21%
2	5	45.45%	7	16.67%	15	41.67%	5	29.41%	20	38.46%	24	58.53%	31	34.83%
3	4	36.37%	14	33.33%	16	44.44%	5	29.41%	16	30.77%	5	12.20%	21	23.60%
4	1	9.09%	2	4.76%	3	8.33%	3	17.65%	5	9.62%	4	9.76%	11	12.36%
5			2	4.76%	1	2.78%			1	1.92%				
6			3	7.15%										

Table 10-4: Attribute analysis of platform cores.

Core Platform Type	Climpy	%	Daer 84	%	Daer 85	%	Powbrone	%	Daer Reservoir	%	Loch Doon	%	Weston	%
Blade	5	45.46%	13	30.95%	15	41.67%	4	23.53%	33	63.46%	25	60.98%	39	43.82%
Flake	3	27.27%	25	59.52%	16	44.44%	12	70.59%	1	1.92%	6	14.63%	5	5.62%
Non-specific	3	27.27%	4	9.53%	5	13.89%	1	5.88%	18	34.62%	10	24.39%	45	50.56%
Predominant Removal														
Indeterminate			4	9.53%	3	8.33%	1	5.88%						
Flake	3	27.27%	22	52.38%	12	33.33%	12	70.59%	1	1.92%	6	14.63%	5	5.62%
Blade	5	45.46%	13	30.95%	15	41.67%	4	23.53%	33	63.46%	25	60.98%	39	43.82%
Mixed	3	27.27%	3	7.14%	6	16.67%			18	34.62%	10	24.39%	45	50.56%
Number of Scars														
Average	9.6		6.1		7.8		5.1		9		8.8		9.2	
1-3			10	23.81%	2	5.56%	6	35.29%	5	9.62%	1	2.44%		
4-6	4	36.37%	15	35.71%	8	22.22%	7	41.18%	8	15.38%	8	19.51%	18	20.22%
7-9	5	45.46%	9	21.43%	18	50.00%	3	17.65%	16	30.77%	14	34.15%	35	39.34%
10-12	3	27.27%	6	14.29%	7	19.44%	1	5.88%	13	25.00%	12	29.27%	25	28.09%
13-15			2	4.76%	1	2.78%			7	13.46%	5	12.20%	7	7.86%
16-18									2	3.85%			1	1.12%
19-21									1	1.92%	1	2.43%	3	3.37%
Original Pebble Size														
Indeterminate	5	45.46%	21	50.00%	24	66.67%	13	76.47%	35	67.31%	15	36.58%	54	60.67%
Small									1	1.92%	8	19.51%	3	3.37%
Medium	6	54.54%	21	50.00%	12	33.33%	4	23.53%	16	30.77%	15	36.58%	32	35.96%
Large											3	7.32%		
Angularity/Sphericity														
Indeterminate	6	54.54%	21	50.00%	24	66.67%	11	64.72%	35	67.31%	15	36.58%	54	60.68%
Angular	5	45.46%	11	26.19%	4	9.09%	1	5.88%			6	14.64%	26	29.21%
Sub-angular			2	4.76%	5	15.15%	1	5.88%	9	17.31%	7	17.07%	4	4.49%
Sub-rounded			7	16.67%	3	9.09%	2	11.76%	8	15.38%	12	29.27%	5	5.62%
Rounded			1	2.38%			2	11.76%			1	2.44%		
Cortex Type														
Absent	5	45.46%	9	23.54%	19	52.78%	7	41.18%	15	28.85%	7	17.07%	31	34.84%
Smooth/chalky			20	44.11%	11	30.55%			28	53.84%	18	43.91%	26	29.21%
Smooth/hard	6	54.54%	11	26.19%	6	16.67%	9	52.94%	3	5.77%	15	36.58%	28	31.46%
Pitted/heavily pitted			2	4.76%			1	5.88%	6	11.54%	1	2.44%	4	4.49%
Platform Type														
Unprepared	1	9.09%							1	1.92%			2	2.25%
Simple	10	90.91%	29	69.05%	20	55.56%	9	52.95%	33	63.46%	32	78.05%	42	47.19%
Complex			2	4.76%			2	11.76%					3	3.37%
Lost			11	26.19%	16	44.44%	6	35.29%	18	34.62%	9	21.95%	42	47.19%

Table 10-5: Continuation of attribute analysis of platform cores.

10.1.4 Size dimensions of platform cores

Daer 84 (n=13)			
Chert (n=13)	**L mm**	**W mm**	**Th mm**
Maximum	32	33	25
Minimum	15	10	8
Average	22.85	18.46	14.46
STDEV	4.69	6.49	5.13
Mode	20	15	17
Powbrone (n=4)			
Chert (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	18	12	10
Minimum	18	12	10
Average	18	12	10
Mode	18	12	10
Flint (n=2)	**L mm**	**W mm**	**Th mm**
Maximum	20	15	10
Minimum	15	13	8
Average	17.5	14	9
STDEV	3.54	1.41	1.41
Mode			
Indeterminate (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	16	13	3
Minimum	16	13	3
Average	16	13	3
Mode	16	13	3
Loch Doon (n=25)			
Chert (n=9)	**L mm**	**W mm**	**Th mm**
Maximum	40	35	27
Minimum	18	13	8
Average	27	23.33	15.33
STDEV	7.92	6.71	6.13
Mode	18		8
Flint (n=15)	**L mm**	**W mm**	**Th mm**
Maximum	44	39	28
Minimum	20	13	9
Average	28.27	23.93	18.73
STDEV	7.68	7.22	7.28
Mode	24	30	14
Chalcedony (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	19	19	6
Minimum	19	19	6
Average	19	19	6
Mode	19	19	6
Climpy (n=5)			
Chert (n=5)	**L mm**	**W mm**	**Th mm**
Maximum	29	30	19
Minimum	21	11	9
Average	25	20.4	15
STDEV	3.39	7.33	3.94

Daer 85 (n=15)			
Chert (n=14)	**L mm**	**W mm**	**Th mm**
Maximum	33	30	19
Minimum	18	13	7
Average	24.57	20.64	14.36
STDEV	4.57	5.15	3.75
Mode	23	20	15
Siltstone (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	32	21	17
Minimum	32	21	17
Average	32	21	17
Mode	32	21	17
Daer Reservoir (n=33)			
Chert (n=11)	**L mm**	**W mm**	**Th mm**
Maximum	31	28	27
Minimum	19	15	8
Average	25.82	21.27	12.82
STDEV	4.92	5.24	5.55
Mode	31	25	12
Flint (n=19)	**L mm**	**W mm**	**Th mm**
Maximum	35	40	23
Minimum	18	16	10
Average	26.05	24.74	15.95
STDEV	4.6	6.45	3.63
Mode	23	23	12
Chalcedony (n=2)	**L mm**	**W mm**	**Th mm**
Maximum	27	23	18
Minimum	25	15	10
Average	26	19	14
STDEV	1.41	5.66	5.66
Siltstone (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	32	17	14
Minimum	32	17	14
Average	32	17	14
Mode	32	17	14
Weston (n=39)			
Chert (n=34)	**L mm**	**W mm**	**Th mm**
Maximum	31	33	21
Minimum	10	11	7
Average	20.35	18.18	13.44
STDEV	5.19	4.55	3.19
Mode	22	16	14
Flint (n=5)	**L mm**	**W mm**	**Th mm**
Maximum	31	30	17
Minimum	17	12	8
Average	22	17.2	11.8
STDEV	5.92	7.33	3.27
Mode			11

Table 10-6: Size dimensions of platform blade cores.

Daer 84 (n=25)				**Daer 85 (n=16)**			
Chert (n=24)	**L mm**	**W mm**	**Th mm**	**Chert (n=16)**	**L mm**	**W mm**	**Th mm**
Maximum	33	38	22	Maximum	36	33	27
Minimum	14	16	10	Minimum	16	15	8
Average	25.17	21.17	15.58	Average	27.31	24.5	17.13
STDEV	4.41	4.6	3.41	STDEV	5.55	5.55	5.27
Mode	25	19	17	Mode	28	23	13
Flint (n=1)	**L mm**	**W mm**	**Th mm**	**Powbrone (n=12)**			
Maximum	22	21	15	**Chert (n=7)**	**L mm**	**W mm**	**Th mm**
Minimum	22	21	15	Maximum	40	30	21
Average	22	21	15	Minimum	11	7	10
Mode	22	21	15	Average	24	20.71	13.14
Daer Reservoir (n=1)				STDEV	9.11	8.01	3.76
Flint (n=1)	**L mm**	**W mm**	**Th mm**	Mode		30	10
Maximum	40	30	24	**Flint (n=1)**	**L mm**	**W mm**	**Th mm**
Minimum	40	30	24	Maximum	32	23	16
Average	40	30	24	Minimum	32	23	16
Mode	40	30	24	Average	32	23	16
Loch Doon (n=6)				Mode	32	23	16
Chert (n=3)	**L mm**	**W mm**	**Th mm**	**Agate (n=2)**	**L mm**	**W mm**	**Th mm**
Maximum	54	49	33	Maximum	19	10	7
Minimum	30	25	22	Minimum	17	10	4
Average	41	37.33	26.67	Average	18	10	5.5
STDEV	12.12	12.01	5.69	STDEV	1.41		2.12
Flint (n=2)	**L mm**	**W mm**	**Th mm**	Mode		10	
Maximum	28	28	25	**Jasper (n=1)**	**L mm**	**W mm**	**Th mm**
Minimum	26	23	14	Maximum	22	16	16
Average	27	25.5	14.5	Minimum	22	16	16
STDEV	1.41	3.54	7.78	Average	22	16	16
Siltstone (n=1)	**L mm**	**W mm**	**Th mm**	Mode	22	16	16
Maximum	40	66	58	**Quartz (n=1)**	**L mm**	**W mm**	**Th mm**
Minimum	40	66	58	Maximum	36	18	11
Average	40	66	58	Minimum	36	18	11
Mode	40	66	58	Average	36	18	11
Weston (n=5)				Mode	36	18	11
Chert (n=5)	**L mm**	**W mm**	**Th mm**	**Climpy (n=3)**			
Maximum	27	24	21	**Chert (n=3)**	**L mm**	**W mm**	**Th mm**
Minimum	12	19	9	Maximum	29	26	24
Average	20.2	21	16.6	Minimum	19	10	6
STDEV	5.81	2.35	4.56	Average	24	19	12.67
Mode		19	17	STDEV	5	8.19	9.87

Table 10-7: Size dimensions of flake platform cores.

Daer 84 (n=4)			
Chert (n=4)	**L mm**	**W mm**	**Th mm**
Maximum	31	28	21
Average	22	22.5	16.75
STDEV	7.53	4.93	4.19
Powbrone (n=1)			
Flint (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	21	16	11
Minimum	21	16	11
Average	21	16	11
Mode	21	16	11
Loch Doon (n=10)			
Chert (n=4)	**L mm**	**W mm**	**Th mm**
Maximum	25	33	30
Minimum	17	16	11
Average	22	22.25	16.25
STDEV	3.56	7.41	9.18
Mode		20	12
Flint (n=5)	**L mm**	**W mm**	**Th mm**
Maximum	32	33	23
Minimum	15	16	8
Average	23.5	24.5	15.5
STDEV	7.06	7.96	6.46
Chalcedony (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	20	17	15
Minimum	20	17	15
Average	20	17	15
Mode	20	17	15

Daer 85 (n=5)			
Chert (n=5)	**L mm**	**W mm**	**Th mm**
Maximum	27	29	12
Average	20.2	19.8	10.6
STDEV	6.72	5.45	1.52
Mode	24		12
Daer Reservoir (n=18)			
Chert (n=8)	**L mm**	**W mm**	**Th mm**
Maximum	34	35	29
Minimum	13	19	10
Average	24.38	26.88	18.25
STDEV	7.56	5.94	8.21
Mode		30	11
Flint (n=9)	**L mm**	**W mm**	**Th mm**
Maximum	49	30	34
Minimum	23	19	9
Average	31.89	26.89	16.78
STDEV	7.46	5.3	7.17
Mode			18
Chalcedony (n=1)	**L mm**	**W mm**	**Th mm**
Maximum	18	25	13
Minimum	18	25	13
Average	18	25	13
Mode	18	25	13
Weston (n=45)			
Chert (n=40)	**L mm**	**W mm**	**Th mm**
Maximum	34	29	27
Minimum	9	11	6
Average	19.65	20.7	15.15
STDEV	4.83	4.48	5.08
Mode	18	17	13
Flint (n=5)	**L mm**	**W mm**	**Th mm**
Maximum	26	24	18
Minimum	14	16	12
Average	20	19.6	14.4
STDEV	4.42	2.88	2.3

Table 10-8: Size dimensions of non-specific platform cores.

10.1.5 Bipolar flakes: attributes

	Daer 84 Chert Bipolar	%	Flint Bipolar	%	Daer 85 Chert Bipolar	%	Flint Bipolar	%
Fragmentation Patterns								
Complete	41	29.72%			21	22.58%	2	66.67%
Proximal missing	38	27.54%	1	33.33%	27	29.02%		
Distal missing	12	8.70%			6	6.45%		
Proximal fragment	1	0.72%						
Distal fragment	6	4.35%			5	5.38%		
Medial fragment	2	1.44%	1	33.33%	3	3.23%		
Split/truncated width	5	3.62%			7	7.53%		
Proximal spalling	26	18.84%	1	33.33%	21	22.58%		
Distal spalling	7	5.07%			3	3.23%	1	33.33%
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Distal Termination								
Abrupt	18	13.04%			11	11.83%		
Hinge	3	2.17%	1	33.33%	7	7.53%		
Plunging	2	1.45%						
Feathered								
Crushed	1	0.72%						
Jagged/irregular	90	65.23%	2	66.67%	56	60.22%	2	66.67%
Distal spalling	24	17.39%			19	20.42%	1	33.33%
Languette								
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Bulb Types								
Absent	46	33.33%	2	66.67%	35	37.63%		
Flat	4	2.90%			17	18.28%		
Pronounced	35	25.36%			14	15.05%	1	33.33%
Diffuse	49	35.52%			26	27.96%	2	66.67%
Bulb with lip	2	1.45%	1	33.33%				
Lip	1	0.72%						
Pronounced lip	1	0.72%			1	1.08%		
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Location of Cortex								
Absent	61	44.21%	1	33.33%	55	59.14%	1	33.33%
Proximal	11	7.97%			1	1.08%	1	33.33%
Distal	12	8.70%	1	33.33%	6	6.45%		
Lateral left	14	10.14%			7	7.53%		
Lateral right	14	10.14%	1	33.33%	4	4.30%		
Combination	18	13.04%			16	17.20%		
Total	8	5.80%			4	4.30%	1	33.33%
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Cortex Type								
Absent	61	44.21%	1	33.33%	55	59.14%	1	33.33%
Smooth/chalky	22	15.94%			20	21.51%	2	66.67%
Smooth/hard	39	28.26%	2	66.67%	13	13.98%		
Pitted	13	9.42%			3	3.22%		
Heavily pitted	3	2.17%			2	2.15%		
	138	100.00%	3	100.00%	93	100.00%	3	100.00%

Table 10-9: Attribute analysis of bipolar chert and flint flakes from Daer 84 and Daer 85.

	Daer 84 Chert Bipolar	%	Flint Bipolar	%	Daer 85 Chert Bipolar	%	Flint Bipolar	%
Dorsal Scarring Pattern								
Absent	9	6.52%			4	4.30%	1	33.34%
Longitudinal	50	36.23%			38	40.86%	1	33.33%
Opposed	18	13.04%			21	22.58%		
Crossed	8	5.80%						
Multi-directional	53	38.41%	3	100.00%	30	32.26%	1	33.33%
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Dorsal Surface								
Absent	100	72.47%	2	66.67%	64	68.81%	2	66.67%
Step	33	23.91%	1	33.33%	26	27.96%	1	33.33%
Hinge	3	2.17%			3	3.23%		
Step & hinge	2	1.45%						
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Platform Preparation								
Indeterminate	54	39.14%	2	66.67%	47	50.54%		
Cortical	18	13.04%			9	9.67%	2	66.67%
Plain/simple	60	43.48%	1	33.33%	35	37.63%	1	33.33%
Plain w/scrub preparation	3	2.17%			1	1.08%		
Plain w/isolated scrub	2	1.45%			1	1.08%		
Facetted	1	0.72%						
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Remaining Platform Size								
Indeterminate	64	46.38%	2	66.67%	43	46.23%	2	66.67%
Point only	18	13.04%	1	33.33%	22	23.65%	1	33.33%
Small/narrow	12	8.70%			7	7.53%		
Small/wide	12	8.70%			3	3.23%		
Broad/narrow	3	2.17%			7	7.53%		
Large	18	13.04%			6	6.45%		
Crushed	11	7.97%			5	5.38%		
	138	100.00%	3	100.00%	93	100.00%	3	100.00%
Colour								
Greenish greys	106	76.82%			65	69.88%		
Greys	30	21.74%	2	66.67%	26	27.96%	2	66.67%
Black					1	1.08%		
Browns	1	0.72%	1	33.33%	1	1.08%	1	33.33%
Reds	1	0.72%						
	138	100.00%	3	100.00%	93	100.00%	3	100.00%

Table 10-10: Continuation of the attribute analysis of the bipolar chert and flint flakes from Daer 84 and Daer 85.

	Chert	%	Flint	%	Quartz	%	Qz	%
Fragmentation Patterns								
Complete	53	32.92%	14	27.46%	27	46.55%	35	36.09%
Proximal missing	25	15.53%	9	17.65%	13	22.41%	8	8.25%
Distal missing	13	8.07%	4	7.84%	1	1.72%	4	4.12%
Proximal fragment	7	4.35%	3	5.88%	0		1	1.03%
Distal fragment	8	4.97%	3	5.88%	7	12.07%	9	9.28%
Medial fragment	3	1.86%	0		0		0	
Split/truncated width	4	2.48%	5	9.80%	4	6.90%	5	5.15%
Proximal spalling	45	27.96%	10	19.61%	3	5.17%	21	21.65%
Distal spalling	3	1.86%	3	5.88%	3	5.18%	14	14.43%
	161		51		58		97	
Distal Termination								
Abrupt	21	13.04%	2	3.92%	4	6.90%	12	12.37%
Hinge	6	3.73%	2	3.92%	0		0	
Plunging	2	1.24%	2	3.92%	1	1.72%	0	
Feathered	5	3.11%	4	7.84%	3	5.17%	1	1.03%
Crushed	0		2	3.92%	0		0	
Jagged/irregular	110	68.32%	37	72.55%	41	70.69%	72	74.23%
Distal spalling	15	9.32%	2	3.93%	9	15.52%	12	12.37%
Languette	2	1.24%	0		0		0	
	161		51		58		97	
Bulb Types								
Absent	36	23.61%	12	23.53%	20	34.48%	17	17.53%
Flat	0		0		1	1.73%	3	3.09%
Pronounced	53	32.92%	18	35.30%	6	10.35%	28	28.87%
Diffuse	66	40.99%	19	37.25%	31	53.44%	48	49.48%
Bulb with lip	2	1.24%	1	1.96%	0		0	
Lip	0		1	1.96%	0		0	
Pronounced lip	2	1.24%					1	1.03%
	159		51		58		97	
Location of Cortex								
Absent	105	65.22%	21	41.18%	36	62.07%	46	47.43%
Proximal	14	8.70%	1	1.96%	9	15.52%	10	10.31%
Distal	11	6.83%	2	3.92%	3	5.17%	1	1.03%
Lateral left	5	3.10%	4	7.84%	0		3	3.09%
Lateral right	7	4.35%	4	7.84%	1	1.72%	2	2.06%
Combination	14	8.69%	9	17.65%	0		11	11.34%
Total	5	3.11%	10	19.61%	9	15.52%	24	24.74%
	161		51		58		97	
Cortex Type								
Absent	105	65.22%	21	41.18%	36	62.07%	46	47.43%
Smooth/chalky	0		0		0		0	
Smooth/hard	46	28.57%	24	47.06%	16	27.59%	37	38.14%
Pitted/heavily pitted	10	6.21%	6	11.77%	6	10.34%	14	14.43%
	161		51		58		97	

Table 10-11: Attribute analysis of bipolar flakes from Powbrone.

	Chert	%	Flint	%	Quartz	%	Qz	%
Dorsal Scarring Pattern								
Absent	7	4.35%	12	23.53%	10	17.24%	26	26.80%
Longitudinal	31	19.25%	4	7.84%	20	34.48%	40	41.24%
Opposed	26	16.15%	11	21.57%	14	24.14%	20	20.62%
Crossed	19	11.80%	10	19.61%	4	6.90%	4	4.12%
Multi-directional	78	48.45%	14	27.45%	10	17.24%	7	7.22%
	161		51		58		97	
Dorsal Surface								
Absent	100	62.11%	26	50.98%	48	82.76%	83	85.57%
Step	44	27.33%	10	19.61%	7	12.07%	12	12.37%
Hinge	11	6.83%	4	7.84%	1	1.72%	2	2.06%
Step & hinge	6	3.73%	9	17.65%	2	3.45%	0	
Pot lid	0		2	3.92%	0		0	
	161		51		58		97	
Platform Preparation								
Indeterminate	61	37.89%	14	27.45%	24	41.38%	23	23.71%
Cortical	23	14.29%	12	23.53%	16	27.59%	27	27.84%
Plain/simple	67	41.62%	18	35.30%	18	31.03%	44	45.36%
Plain w/scrub preparation	4	2.48%	3	5.88%	0		1	1.03%
Plain w/isolated scrub	4	2.48%	1	1.96%	0		1	1.03%
Facetted	2	1.24%	3	5.88%	0		1	1.03%
	161		51		58		97	
Remaining Platform Size								
Indeterminate	60	37.26%	21	41.18%	34	58.62%	40	41.24%
Point only	39	24.22%	11	21.58%	8	13.79%	12	12.37%
Small/narrow	6	3.73%	2	3.92%	2	3.45%	5	5.15%
Small/wide	14	8.70%	5	9.80%	2	3.45%	6	6.19%
Broad/narrow	5	3.11%	2	3.92%	1	1.72%	3	3.09%
Large	26	16.15%	5	9.80%	9	15.52%	24	24.74%
Crushed	11	6.83%	5	9.80%	2	3.45%	7	7.22%
	161		51		58		97	
Colour								
Greenish greys	113	73.85%	1	3.13%	0		7	8.14%
Greys	32	20.92%	16	50.00%	1	1.82%	63	73.26%
Black	2	1.31%	0		0		0	
Browns	6	3.92%	14	27.45%	0		1	1.16%
Reds	0		1	3.12%	0		15	17.44%
Whites	0		0		54	98.18%	0	
	153		32		55		86	

Table 10-12: Continuation of the attribute analysis of the bipolar flakes from Powbrone.

	Climpy Chert Bipolar	%	Flint Bipolar	%		Climpy Chert Bipolar	%	Flint Bipolar	%
Fragmentation Patterns					**Dorsal Scarring Pattern**				
Complete	25	37.88%	2	100%	Absent	3	3.03%		
Proximal missing	12	18.18%			Longitudinal	17	25.76%		
Split/truncated width	8	12.12%			Opposed	20	30.30%	2	100%
Proximal spalling	17	25.76%			Crossed	6	9.09%		
Distal spalling	4	6.06%			Multi-directional	20	30.31%		
	66	100%	2	100%		66	100%	2	100%
Distal Termination					**Dorsal Surface**				
Abrupt	17	25.76%			Absent	24	36.36%	2	100%
Plunging	2	3.03%			Step	35	53.03%		
Feathered	11	16.67%			Hinge	6	9.09%		
Jagged/irregular	35	53.03%	2	100%	Step & hinge	1	1.52%		
Distal spalling	1	1.51%				66	100%	2	100%
	66	100%	2	100%					
					Platform Preparation				
Bulb Types					Indeterminate	12	18.18%		
Absent	20	30.30%			Cortical	4	6.06%		
Pronounced	2	3.03%			Plain/simple	50	75.76%	2	100%
Diffuse	44	66.67%	2	100%		66	100%	2	100%
	66	100%	2	100%					
					Colour				
Location of Cortex					Greenish greys	48	85.72%		
Absent	17	25.76%	2	100%	Greys	6	10.71%	1	50.00%
Proximal	4	6.06%			Black				
Distal	5	7.58%			Browns	2	3.57%	1	50.00%
Lateral left	6	9.09%			Reds				
Lateral right	8	12.12%				56	100%	2	100%
Combination	20	30.30%							
Total	6	9.09%							
	66	100%	2	100%					
Cortex Type									
Absent	17	25.76%	2	100%					
Smooth/hard	9	13.63%							
Pitted	40	60.61%							
	66	100%	2	100%					

Table 10-13: Attribute analysis of bipolar flakes from Climpy.

10.1.6 Platform flakes: attributes

	Daer 84				Daer 85			
	Chert		Flint		Chert		Flint	
	Platform	%	Platform	%	Platform	%	Platform	%
Fragmentation Patterns								
Complete	188	33.16%	9	56.25%	243	39.39%	32	58.18%
Proximal missing	114	20.11%	3	18.75%	99	16.05%	10	18.18%
Distal missing	96	16.93%			59	9.56%	5	9.09%
Proximal fragment	11	1.94%			7	1.13%		
Distal fragment	20	3.53%			16	2.59%		
Medial fragment	21	3.70%	1	6.25%	34	5.51%		
Split/truncated width	22	3.87%			21	3.40%	1	1.82%
Proximal spalling	91	16.05%	3	18.75%	133	21.56%	7	12.73%
Distal spalling	4	0.71%			5	0.81%		
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Distal Termination								
Abrupt	227	40.03%	5	31.25%	223	36.14%	15	27.27%
Hinge	53	9.35%	1	6.25%	64	10.37%	8	14.55%
Plunging	31	5.47%			12	1.94%	1	1.82%
Feathered	104	18.34%	4	25.00%	133	21.56%	8	14.55%
Crushed								
Jagged/irregular	132	23.28%	5	31.25%	157	25.45%	20	36.36%
Distal spalling	14	2.47%	1	6.25%	24	3.89%	3	5.45%
Languette	6	1.06%			4	0.65%		
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Bulb Types								
Absent	153	26.98%	4	25.00%	149	24.15%	10	18.18%
Flat	30	5.29%			97	15.72%	5	9.09%
Pronounced	36	6.35%	1	6.25%	42	6.81%	5	9.09%
Diffuse	316	55.72%	10	62.50%	309	50.08%	35	63.64%
Bulb with lip	18	3.17%	1	6.25%	1	0.16%		
Lip	12	2.14%			17	2.76%		
Pronounced lip	2	0.35%			2	0.32%		
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Location of Cortex								
Absent	401	70.73%	7	43.75%	439	71.15%	25	45.45%
Proximal	19	3.35%	2	12.50%	27	4.38%	3	5.45%
Distal	38	6.70%			39	6.32%	6	10.91%
Lateral left	35	6.17%	2	12.50%	35	5.67%	5	9.09%
Lateral right	37	6.53%	3	18.75%	37	6.00%	6	10.91%
Combination	26	4.58%	1	6.25%	30	4.86%	8	14.55%
Total	11	1.94%	1	6.25%	10	1.62%	2	3.64%
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Cortex Type								
Absent	401	70.73%	7	43.75%	439	71.15%	25	45.45%
Smooth/chalky	42	7.40%	5	31.25%	143	23.18%	24	43.64%
Smooth/hard	105	18.52%	4	25.00%	33	5.35%	6	10.91%
Pitted	15	2.65%			2	0.32%		
Heavily pitted	4	0.70%						
	567	100.00%	16	100.00%	617	100.00%	55	100.00%

Table 10-14: Attribute analysis of chert and flint platform flakes from Daer 84 and Daer 85.

	Daer 84 Chert Platform	%	Flint Platform	%	Daer 85 Chert Platform	%	Flint Platform	%
Dorsal Scarring Pattern								
Absent	11	1.94%	1	6.25%	10	1.62%	2	3.64%
Longitudinal	338	59.61%	11	68.75%	399	64.67%	42	76.35%
Opposed	69	12.17%			107	17.34%	7	12.73%
Crossed	34	6.00%			9	1.46%	2	3.64%
Multi-directional	115	20.28%	4	25.00%	92	14.91%	2	3.64%
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Dorsal Surface								
Absent	482	85.01%	15	93.75%	512	82.99%	46	83.63%
Step	73	12.87%	1	6.25%	93	15.07%	7	12.73%
Hinge	8	1.41%			10	1.62%	2	3.64%
Step & hinge	3	0.53%			1	0.16%		
Pot lid	1	0.18%			1	0.16%		
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Platform Preparation								
Indeterminate	186	32.80%	5	31.25%	157	25.45%	10	18.18%
Cortical	26	4.59%	2	12.50%	37	6.00%	7	12.73%
Plain/simple	248	43.74%	4	25.00%	269	43.59%	18	32.73%
Plain w/scrub preparation	35	6.17%	1	6.25%	39	6.32%	1	1.82%
Plain w/isolated scrub	71	12.52%	4	25.00%	114	18.48%	19	34.54%
Facetted								
Facetted w/scrub	1	0.18%			1	0.16%		
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Remaining Platform Size								
Indeterminate	183	32.28%	6	37.50%	186	30.15%	17	30.91%
Point only	185	32.62%	5	31.25%	163	26.42%	9	16.36%
Small/narrow	70	12.35%	2	12.50%	102	16.53%	11	20.00%
Small/wide	38	6.70%	2	12.50%	46	7.46%	8	14.55%
Broad/narrow	30	5.29%			111	17.99%	10	18.18%
Large	59	10.41%	1	6.25%	9	1.45%		
Crushed	2	0.35%						
	567	100.00%	16	100.00%	617	100.00%	55	100.00%
Colour								
Greenish greys	428	75.89%			424	70.21%		
Greys	122	21.63%	13	92.86%	159	26.32%	51	96.23%
Black	8	1.42%			14	2.32%		
Browns	5	0.88%			7	1.15%	2	3.77%
Reds	1	0.18%	1	7.14%				
	564	100.00%	14	100.00%	604	100.00%	53	100.00%
Anvil Supported	13	2.29%	0		8	1.30%	0	

Table 10-15: Continuation of the attribute analysis of chert and flint platform flakes from Daer 84 and Daer 85.

	Chert	%	Flint	%	Quartz	%	Qz	%
Fragmentation Patterns								
Complete	78	27.95%	29	29.30%	21	35.00%	29	40.85%
Proximal missing	48	17.20%	16	16.16%	12	20.00%	5	7.04%
Distal missing	40	14.34%	18	18.18%	6	10.00%	7	9.86%
Proximal fragment	22	7.89%	4	4.04%	2	3.33%	3	4.23%
Distal fragment	18	6.45%	3	3.03%	0		5	7.04%
Medial fragment	15	5.38%	3	3.03%	5	8.33%	4	5.63%
Split/truncated width	3	1.08%	4	4.04%	5	8.34%	2	2.82%
Proximal spalling	55	19.71%	19	19.19%	9	15.00%	16	22.53%
Distal spalling			3	3.03%	0		0	
	279		99		60		71	
Distal Termination								
Abrupt	88	31.54%	25	25.26%	14	23.33%	19	26.76%
Hinge	44	15.77%	15	15.15%	4	6.67%	6	8.45%
Plunging	8	2.87%	1	1.01%	0		0	
Feathered	49	17.56%	24	24.24%	6	10.00%	12	16.90%
Crushed	0		0		0		0	
Jagged/irregular	82	29.39%	31	31.31%	35	58.33%	32	45.07%
Distal spalling	8	2.87%	3	3.03%	1	1.67%	2	2.82%
Languette	0		0		0		0	
	279		99		60		71	
Bulb Types								
Absent	81	29.03%	22	22.22%	17	28.33%	14	19.72%
Flat	6	2.15%	1	1.01%	0		2	2.81%
Pronounced	26	9.32%	13	13.13%	2	3.33%	8	11.27%
Diffuse	161	57.71%	61	61.62%	40	66.67%	46	64.79%
Bulb with lip	5	1.79%	1	1.01%	0		1	1.41%
Lip	0		1	1.01%	0		0	
Pronounced lip	0		0		1	1.67%	0	
	279		99		60		71	
Location of Cortex								
Absent	216	77.42%	63	63.64%	35	58.34%	44	61.97%
Proximal	11	3.94%	8	8.08%	3	5.00%	9	12.68%
Distal	12	4.30%	3	3.03%	2	3.33%	3	4.23%
Lateral left	8	2.87%	5	5.05%	0		1	1.41%
Lateral right	8	2.87%	9	9.09%	5	8.33%	4	5.63%
Combination	18	6.45%	7	7.07%	6	10.00%	5	7.04%
Total	6	2.15%	4	4.04%	9	15.00%	5	7.04%
	279		99		60		71	
Cortex Type								
Absent	216	77.42%	63	63.64%	35	58.33%	44	61.97%
Smooth/chalky	0		0		0		0	
Smooth/hard	54	19.35%	30	30.30%	22	36.67%	22	30.99%
Pitted/heavily pitted	9	3.23%	6	6.06%	3	5.00%	5	7.04%
	279		99		60		71	

Table 10-16: Attribute analysis of platform flakes from Powbrone.

	Chert	%	Flint	%	Quartz	%	Qz	%
Dorsal Scarring Pattern								
Absent	7	2.51%	6	6.06%	13	21.67%	6	8.45%
Longitudinal	133	47.67%	42	42.43%	32	53.33%	37	52.12%
Opposed	41	14.70%	17	17.17%	10	16.67%	19	26.76%
Crossed	27	9.68%	13	13.13%	4	6.67%	4	5.63%
Multi-directional	71	25.44%	21	21.21%	1	1.66%	5	7.04%
	279		99		60		71	
Dorsal Surface								
Absent	232	83.15%	85	85.86%	56	93.33%	65	91.55%
Step	39	13.98%	12	12.12%	4	6.67%	4	5.63%
Hinge	6	2.15%	1	1.01%	0		1	1.41%
Step & hinge	1	0.36%	0		0		0	
Pot lid	1	0.36%	1	1.01%	0		1	1.41%
	279		99		60		71	
Platform Preparation								
Indeterminate	117	41.93%	33	33.33%	20	33.33%	23	32.39%
Cortical	19	6.81%	12	12.12%	13	21.67%	13	18.31%
Plain/simple	116	41.58%	37	37.38%	25	41.67%	34	47.89%
Plain w/scrub preparation	13	4.66%	7	7.07%	1	1.67%	0	
Plain w/isolated scrub	14	5.02%	9	9.09%	1	1.66%	1	1.41%
Facetted	0		1	1.01%	0		0	
	279		99		60		71	
Remaining Platform Size								
Indeterminate	106	37.99%	33	33.34%	29	48.34%	29	40.85%
Point only	85	30.46%	27	27.27%	14	23.33%	14	19.72%
Small/narrow	25	8.96%	14	14.14%	1	1.67%	2	2.82%
Small/wide	15	5.38%	6	6.06%	2	3.33%	7	9.86%
Broad/narrow	21	7.53%	9	9.09%	0		4	5.63%
Large	27	9.68%	10	10.10%	14	23.33%	15	21.12%
	279		99		60		71	
Anvil Supported	19	6.81%	11	11.11%	5	8.33%	3	4.22%
Colour								
Greenish greys	206	78.93%	1	1.37%	0		5	8.06%
Greys	52	19.92%	52	71.23%	1	1.82%	47	75.81%
Black	1	0.38%	0		0		0	
Browns	2	0.77%	19	26.03%	0		2	3.23%
Reds	0		0		0		7	11.29%
White	0		0		54	98.18%	1	1.61%
Pink	0		1	1.37%	0		0	
	261		73		55		62	

Table 10-17: Continuation of the attribute analysis of platform flakes from Powbrone.

	Climpy Chert Platform	%	Flint Platform	%
Fragmentation Patterns				
Complete	71	39.66%	2	67%
Proximal missing	37	20.67%		
Distal missing	1	0.56%		
Distal fragment	2	1.12%		
Median fragment	7	3.91%		
Split/truncated width	9	5.03%		
Proximal spalling	48	26.82%	1	33.33%
Distal spalling	4	2.23%		
	179	100%	3	100%
Distal Termination				
Abrupt	45	25.14%		
Hinge	3	1.68%		
Plunging	11	6.14%		
Feathered	53	29.61%	1	33.33%
Jagged/irregular	67	37.43%	2	66.67%
Distal spalling				
	179	100%	3	100%
Bulb Types				
Absent	46	25.70%		
Pronounced	6	3.35%		
Diffuse	127	70.95%	3	100%
	179	100%	3	100%
Location of Cortex				
Absent	82	45.81%	1	33.33%
Proximal	5	2.79%		
Distal	10	5.58%		
Lateral left	25	13.97%		
Lateral right	21	11.73%	2	66.67%
Combination	26	14.53%		
Total	10	5.59%		
	179	100%	3	100%
Cortex Type				
Absent	82	45.81%	1	33.34%
Smooth/hard	91	50.84%	1	33.33%
Pitted	6	3.35%	1	33.33%
	179	100%	3	100%

	Climpy Chert Platform	%	Flint Platform	%
Dorsal Scarring Pattern				
Absent	7	3.91%		
Longitudinal	72	40.22%		
Opposed	40	22.35%	2	66.67%
Crossed	36	20.11%		
Multi-directional	24	13.41%	1	33.33%
	179	100%	3	100%
Dorsal Surface				
Absent	124	69.27%	1	33.33%
Step	49	27.38%	2	66.67%
Hinge	5	2.79%		
Step & hinge	1	0.56%		
	179	100%	3	100%
Platform Preparation				
Indeterminate	46	25.70%		
Cortical	9	5.03%		
Plain/simple	124	69.27%	3	100%
	179	100%	3	100%
Colour				
Greenish greys	139	85.28%		
Greys	22	13.50%	3	100%
Black	1	0.61%		
Browns	**1**	0.61%		
Reds				
	163	100%	3	100%
Anvil Supported	27	15.08%	0	

Table 10-18: Attribute analysis of platform flakes from Climpy.

10.1.7 Bipolar blades: attributes

	Daer 84 Bipolar	%	Daer 85 Bipolar	%
Fragmentation Patterns				
Complete	6	25.00%	4	23.53%
Proximal missing	6	25.00%	3	17.65%
Distal missing	2	8.33%	1	5.88%
Proximal fragment				
Distal fragment				
Medial fragment	1	4.17%	3	17.65%
Split/truncated width	3	12.50%	2	11.76%
Proximal spalling	2	8.33%	3	17.65%
Distal spalling	4	16.67%	1	5.88%
	24	100.00%	17	100.00%
Distal Termination				
Abrupt	5	20.83%		
Hinge	1	4.17%	2	11.76%
Plunging				
Feathered	1	4.17%		
Crushed				
Jagged/irregular	14	58.33%	10	58.83%
Distal spalling	3	12.50%	5	29.41%
Languette				
	24	100.00%	17	100.00%
Bulb Types				
Absent	7	29.17%	6	35.29%
Flat			2	11.77%
Pronounced	4	16.66%	5	29.41%
Diffuse	13	54.17%	4	23.53%
Bulb with lip				
Lip				
Pronounced lip				
	24	100.00%	17	100.00%
Location of Cortex				
Absent	17	70.83%	9	52.95%
Proximal	1	4.17%	1	5.88%
Distal			1	5.88%
Lateral left	1	4.17%	1	5.88%
Lateral right	2	8.33%	1	5.88%
Combination	2	8.33%	3	17.65%
Total	1	4.17%	1	5.88%
	24	100.00%	17	100.00%
Cortex Type				
Absent	17	70.83%	9	52.95%
Smooth/chalky	2	8.33%	6	35.29%
Smooth/hard	4	16.67%	1	5.88%
Pitted	1	4.17%	1	5.88%
Heavily pitted				
	24	100.00%	17	100.00%

Table 10-19: Attribute analysis of chert bipolar blades from Daer 84 and Daer 85.

	Daer 84 Bipolar	%	Daer 85 Bipolar	%
Dorsal Scarring Pattern				
Absent	1	4.17%	1	5.88%
Longitudinal	9	37.50%	7	41.18%
Opposed	6	25.00%	4	23.53%
Multi-directional	8	33.33%	5	29.41%
	24	100.00%	17	100.00%
Dorsal Surface				
Absent	19	79.16%	8	47.05%
Step	4	16.67%	9	52.95%
Pot lid	1	4.17%		
	24	100.00%	17	100.00%
Platform Preparation				
Indeterminate	10	41.66%	7	41.18%
Cortical	4	16.67%	3	17.65%
Plain/simple	9	37.50%	6	35.29%
Plain w/scrub preparation			1	5.88%
Plain w/isolated scrub	1	4.17%		
	24	100.00%	17	100.00%
Remaining Platform Size				
Indeterminate	11	45.82%	9	52.94%
Point only	7	29.17%	3	17.65%
Small/narrow	4	16.67%	3	17.65%
Small/wide	1	4.17%	1	5.88%
Broad/narrow			1	5.88%
Crushed	1	4.17%		
	24	100.00%	17	100.00%
Colour				
Greenish greys	14	58.33%	10	66.67%
Greys	10	41.67%	5	33.33%
	24	100.00%	15	100.00%

Table 10-20: Continuation of the attribute analysis of chert bipolar blades from Daer 84 and Daer 85.

	Daer 85 Bipolar	%		Daer 85 Bipolar	%
Fragmentation Patterns			**Dorsal Scarring Pattern**		
Proximal missing	1	50.00%	Longitudinal	2	100.00%
Proximal spalling	1	50.00%		2	100.00%
	2	100.00%			
			Dorsal Surface		
Distal Termination			Absent	2	100.00%
Jagged/irregular	1	50.00%		2	100.00%
Distal spalling	1	50.00%			
	2	100.00%	**Platform Preparation**		
			Indeterminate	1	50.00%
Bulb Types			Plain/simple	1	50.00%
Absent	1	50.00%		2	100.00%
Diffuse	1	50.00%			
	2	100.00%	**Remaining Platform Size**		
			Indeterminate	1	50.00%
Location of Cortex			Point only	1	50.00%
Distal	1	50.00%		2	100.00%
Lateral left	1	50.00%			
	2	100.00%	**Colour**		
			Greys	1	50.00%
Cortex Type			Reds	1	50.00%
Smooth/chalky	2	100.00%		2	100.00%
	2	100.00%			

Table 10-21: Attribute analysis of flint bipolar blades from Daer 85.

	Chert	%	Flint	%	Quartz	%	Qz	%
Fragmentation Patterns								
Complete	11	28.95%	3	25.00%	4	19.05%	2	13.33%
Proximal missing	9	23.68%	1	8.33%	3	14.29%	5	33.33%
Distal missing	1	2.63%	1	8.33%	1	4.76%	1	6.67%
Split/truncated width	3	7.89%	1	8.34%	5	23.81%	2	13.33%
Proximal spalling	13	34.22%	6	50.00%	7	33.33%	3	20.00%
Distal spalling	1	2.63%	0		1	4.76%	2	13.34%
	38		12		21		15	
Distal Termination								
Abrupt	2	5.26%	3	25.00%	0		5	33.33%
Hinge	1	2.63%	1	8.33%	0		0	
Plunging	0		0		1	4.76%	0	
Feathered	4	10.53%	1	8.33%	1	4.76%	0	
Jagged/irregular	23	60.53%	6	50.00%	12	57.15%	7	46.67%
Distal spalling	8	21.05%	1	8.34%	7	33.33%	3	20.00%
Languette	0		0		0		0	
	38		12		21		15	
Bulb Types								
Absent	9	23.69%	1	8.33%	3	14.29%	5	33.33%
Flat	1	2.63%			1	4.76%	1	6.67%
Pronounced	1	2.63%	3	25.00%	2	9.52%	4	26.67%
Diffuse	27	71.05%	8	66.67%	15	71.43%	5	33.33%
	38		12		21		15	
Location of Cortex								
Absent	29	76.33%	5	41.67%	13	61.90%	10	66.67%
Proximal	0		1	8.33%	0		3	20.00%
Distal	1	2.63%	1	8.33%	0		0	
Lateral left	2	5.26%	2	16.67%	1	4.76%	1	6.67%
Lateral right	3	7.89%	1	8.33%	2	9.53%	1	6.66%
Combination	2	5.26%	2	16.67%	5	23.81%	0	
Total	1	2.63%	0		0		0	
	38		12		21		15	
Cortex Type								
Absent	29	76.32%	5	41.67%	13	61.90%	10	66.67%
Smooth/chalky	0		0		0		0	
Smooth/hard	8	21.05%	5	41.67%	7	33.33%	5	33.33%
Pitted/heavily pitted	1	2.63%	2	16.66%	1	4.77%	0	
	38		12		21		15	

Table 10-22: Attribute analysis of bipolar blades from Powbrone.

	Chert	%	Flint	%	Quartz	%	Qz	%
Dorsal Scarring Pattern								
Absent	1	2.63%	0		0		0	
Longitudinal	5	13.16%	3	25.00%	6	28.57%	8	53.33%
Opposed	14	36.85%	4	33.33%	10	47.62%	2	13.33%
Crossed	3	7.89%	2	16.67%	3	14.29%	2	13.34%
Multi-directional	15	39.47%	3	25.00%	2	9.52%	3	20.00%
	38		12		21		15	
Dorsal Surface								
Absent	25	65.79%	10	83.33%	17	80.95%	14	93.33%
Step	11	28.95%	2	16.67%	4	19.05%	1	6.67%
Step & hinge	2	5.26%	0		0		0	
	38		12		21		15	
Platform Preparation								
Indeterminate	14	36.85%	3	25.00%	6	28.57%	8	53.33%
Cortical	1	2.63%	5	41.67%	3	14.29%	3	20.00%
Plain/simple	19	50.00%	2	16.67%	12	57.14%	4	26.67%
Plain w/scrub preparation	1	2.63%	2	16.66%	0		0	
Plain w/isolated scrub	2	5.26%	0		0		0	
Facetted	1	2.63%	0		0		0	
	38		12		21		15	
Remaining Platform Size								
Indeterminate	11	28.95%	6	50.00%	6	28.57%	6	40.00%
Point only	19	50.00%	3	25.00%	10	47.62%	6	40.00%
Small/narrow	1	2.63%	1	8.33%	3	14.29%	0	
Small/wide	3	7.89%	0		2	9.52%	0	
Broad/narrow	0		0		0		1	6.67%
Large	4	10.53%	0		0		1	6.67%
Crushed	0		2	16.67%	0		1	6.66%
	38		12		21		15	
Colour								
Greenish greys	25	69.44%	0		0		1	6.67%
Greys	10	27.78%	4	50.00%	0		12	80.00%
Browns	1	2.78%	4	50.00%	0		0	
White	0		0		20	100.00%	0	
Reds	0		0		0		2	13.33%
	36		8		20		15	

Table 10-23: Continuation of the attribute analysis of bipolar blades from Powbrone.

10.1.8 Platform blades: attributes

Climpy				
Platform blades	**Chert**	**%**	**Flint**	**%**
Fragmentation Patterns				
Complete	14	28.00%	3	75.00%
Proximal missing	11	22.00%	1	25.00%
Split/truncated width	9	18.00%		
Proximal spalling	16	32.00%		
	50		4	
Distal Termination				
Abrupt	8	16.00%	1	25.00%
Hinge	1	2.00%		
Plunging	2	4.00%		
Feathered	29	58.00%	1	25.00%
Jagged/irregular	2	4.00%	2	50.00%
	50		4	
Bulb Types				
Absent	11	22.00%	1	25.00%
Diffuse	39	78.00%	3	75.00%
	50		4	
Location of Cortex				
Absent	36	72.00%	2	50.00%
Proximal	1	2.00%		
Distal	1	2.00%		
Lateral left	4	8.00%		
Lateral right	4	8.00%		
Combination	3	6.00%	2	50.00%
Total	1	2.00%		
	50		4	
Cortex Type				
Absent	36	72.00%	2	50.00%
Smooth/hard	14	28.00%	2	50.00%
	50		4	

Climpy				
	Chert	**%**	**Flint**	**%**
Dorsal Scarring Pattern				
Longitudinal	26	52.00%	2	50.00%
Opposed	14	28.00%	2	50.00%
Crossed	4	8.00%		
Multi-directional	6	12.00%		
	50		4	
Dorsal Surface				
Absent	36	72.00%	2	50.00%
Step	13	26.00%	2	50.00%
Hinge	1	2.00%		
	50		4	
Platform Preparation				
Indeterminate	11	22.00%	1	25.00%
Cortical	1	2.00%	3	75.00%
Plain/simple	24	48.00%		
Plain w/scrub preparation	14	28.00%		
	50		4	
Colour				
Greenish greys	37	88.10%		
Greys	2	4.76%	3	100%
Black	2	4.76%		
Browns	1	2.38%		
	42		3	
Anvil Supported	10	20.00%	0	

Table 10-24: Attribute analysis of chert and flint platform blades from Climpy.

	Daer 84 Platform	%	Daer 85 Platform	%
Fragmentation Patterns				
Complete	98	43.56%	104	38.52%
Proximal missing	43	19.11%	43	15.93%
Distal missing	20	8.89%	18	6.67%
Medial fragment	7	3.11%	6	2.22%
Split/truncated width	18	8.00%	35	12.96%
Proximal spalling	36	16.00%	62	22.96%
Distal spalling	3	1.33%	2	0.74%
	225	100%	270	100%
Distal Termination				
Abrupt	84	37.33%	56	20.75%
Hinge	12	5.33%	21	7.77%
Plunging	5	2.22%	10	3.70%
Feathered	86	38.22%	108	40.00%
Jagged/irregular	31	13.78%	60	22.22%
Distal spalling	6	2.68%	15	5.56%
Languette	1	0.44%		
	225	100%	270	100%
Bulb Types				
Absent	50	22.22%	49	18.15%
Flat	37	16.45%	88	32.60%
Pronounced	8	3.56%	10	3.70%
Diffuse	115	51.11%	114	42.22%
Bulb with lip	7	3.11%		
Lip	8	3.55%	9	3.33%
	225	100%	270	100%
Location of Cortex				
Absent	182	80.88%	214	79.27%
Proximal	5	2.22%	8	2.96%
Distal	6	2.68%	28	10.37%
Lateral left	11	4.89%	6	2.22%
Lateral right	7	3.11%	7	2.59%
Combination	10	4.44%	7	2.59%
Total	4	1.78%		
	225	100%	270	100%
Cortex Type				
Absent	182	80.88%	214	79.26%
Smooth/chalky	7	3.12%	48	17.78%
Smooth/hard	32	14.23%	8	2.96%
Pitted	3	1.33%		
Heavily pitted	1	0.44%		
	225	100%	270	100%

	Daer 84 Platform	%	Daer 85 Platform	%
Dorsal Scarring Pattern				
Absent	4	1.77%		
Longitudinal	138	61.34%	190	70.37%
Opposed	43	19.11%	55	20.37%
Crossed	5	2.22%	3	1.11%
Multi-directional	35	15.56%	22	8.15%
	225	100%	270	100%
Dorsal Surface				
Absent	201	89.34%	229	84.82%
Step	19	8.45%	40	14.81%
Hinge	4	1.77%	1	0.37%
Step & hinge	1	0.44%		
	225	100%	270	100%
Platform Preparation				
Indeterminate	63	28.00%	52	19.26%
Cortical	6	2.67%	5	1.85%
Plain/simple	108	48.00%	146	54.08%
Plain w/scrub preparation	11	4.89%	13	4.81%
Plain w/isolated scrub	37	16.44%	54	20.00%
	225	100%	270	100%
Remaining Platform Size				
Indeterminate	53	23.56%	54	20.00%
Point only	92	40.89%	103	38.15%
Small/narrow	22	9.78%	51	18.89%
Small/wide	13	5.78%	15	5.56%
Broad/narrow	10	4.44%	42	15.55%
Large	32	14.22%	5	1.85%
Crushed	3	1.33%		
	225	100%	270	100%
Anvil Supported	3	1.33%	3	1.11%
Colour				
Greenish greys	169	75.44%	188	70.15%
Greys	51	22.77%	66	24.63%
Black	2	0.89%	12	4.48%
Browns	1	0.45%	2	0.74%
Reds	1	0.45%		
	224	100%	268	100%

Table 10-25: Attribute analysis of chert platform blades from Daer 84 and Daer 85.

	Daer 84 Platform	%	Daer 85 Platform	%
Fragmentation Patterns				
Complete	5	55.56%	27	55.10%
Proximal missing	2	22.22%	9	18.37%
Distal missing	1	11.11%	2	4.08%
Medial fragment			1	2.04%
Split/truncated width			1	2.04%
Proximal spalling	1	11.11%	9	18.37%
	9	100%	49	100%
Distal Termination				
Abrupt	3	33.33%	13	26.53%
Hinge			3	6.12%
Feathered	4	44.45%	19	38.78%
Jagged/irregular	1	11.11%	12	24.49%
Distal spalling	1	11.11%	1	2.04%
Languette			1	2.04%
	9	100%	49	100%
Bulb Types				
Absent	2	22.22%	10	20.41%
Flat			9	18.37%
Pronounced			1	2.04%
Diffuse	6	66.67%	28	57.14%
Lip	1	11.11%	1	2.04%
	9	100%	49	100%
Location of Cortex				
Absent	4	44.45%	26	53.07%
Proximal	2	22.22%	5	10.20%
Distal	1	11.11%	4	8.16%
Lateral left	1	11.11%	3	6.12%
Lateral right			3	6.12%
Combination	1	11.11%	2	4.08%
Total			6	12.25%
	9	100%	49	100%
Cortex Type				
Absent	4	44.45%	26	53.07%
Smooth/chalky	1	11.11%	18	36.73%
Smooth/hard	3	33.33%	5	10.20%
Pitted	1	11.11%		
	9	100%	49	100%

	Daer 84 Platform	%	Daer 85 Platform	%
Dorsal Scarring Pattern				
Absent			2	4.08%
Longitudinal	5	55.56%	35	71.43%
Opposed	3	33.33%	9	18.37%
Multi-directional	1	11.11%	3	6.12%
	9	100%	49	100%
Dorsal Surface				
Absent	7	77.78%	40	81.63%
Step	2	22.22%	7	14.29%
Hinge			2	4.08%
	9	100%	49	100%
Platform Preparation				
Indeterminate	2	22.22%	10	20.41%
Cortical	2	22.22%	9	18.37%
Plain/simple	3	33.34%	12	24.49%
Plain w/scrub preparation	1	11.11%	7	14.29%
Plain w/isolated scrub	1	11.11%	11	22.54%
	9	100%	49	100%
Remaining Platform Size				
Indeterminate	4	44.45%	19	38.78%
Point only	2	22.22%	13	26.53%
Small/narrow	1	11.11%	9	18.37%
Small/wide	1	11.11%	2	4.08%
Broad/narrow			6	12.24%
Large	1	11.11%		
	9	100%	49	100%
Anvil Supported	1	11.11%	1	2.04%
Colour				
Greenish greys				
Greys	6	85.71%	40	85.11%
Black			1	2.13%
Browns			6	12.76%
Reds	1	14.29%		
	7	100%	47	100%

Table 10-26: Attribute analysis of flint blades from Daer 84 and Daer 85.

Powbrone	Chert	%	Flint	%	Quartz	%	Qz	%
Fragmentation Patterns								
Complete	39	41.93%	18	54.55%	5	31.25%	2	25.00%
Proximal missing	20	21.51%	7	21.21%	2	12.50%	2	25.00%
Distal missing	13	13.98%	4	12.12%	0		0	
Proximal fragment	1	1.07%	0		0		0	
Medial fragment	2	2.15%	1	3.03%	1	6.25%	0	
Split/truncated width	7	7.53%	1	3.03%	5	31.25%	2	25.00%
Proximal spalling	11	11.83%	2	6.06%	2	12.50%	1	12.50%
Distal spalling	0		0		1	6.25%	1	12.50%
	93		33		16		8	
Distal Termination								
Abrupt	24	25.81%	8	24.24%	3	18.75%	1	12.50%
Hinge	8	8.60%	3	9.09%	0		0	
Plunging	8	8.60%	3	9.09%	0		0	
Feathered	37	39.79%	12	36.37%	6	37.50%	0	
Jagged/irregular	14	15.05%	7	21.21%	7	43.75%	5	62.50%
Distal spalling	1	1.07%	0		0		2	25.00%
Languette	1	1.08%	0		0		0	
	93		33		16		8	
Bulb Types								
Absent	22	23.66%	8	24.24%	3	18.75%	2	25.00%
Flat	1	1.07%	1	3.03%	1	6.25%	0	
Pronounced	3	3.22%	3	9.09%	0		0	
Diffuse	64	68.82%	21	63.64%	12	75.00%	6	75.00%
Bulb with lip	2	2.15%	0		0		0	
Lip	1	1.08%	0		0		0	
	93		33		16		8	
Location of Cortex								
Absent	78	83.87%	20	60.61%	11	68.75%	2	25.00%
Proximal	5	5.38%	0		0		0	
Distal	4	4.30%	4	12.12%	1	6.25%	0	
Lateral left	1	1.08%	2	6.06%	0		1	12.50%
Lateral right	2	2.15%	2	6.06%	0		1	12.50%
Combination	3	3.22%	5	15.15%	2	12.50%	3	37.50%
Total	0		0		2	12.50%	1	12.50%
	93		33		16		8	
Cortex Type								
Absent	78	83.87%	20	60.61%	11	68.75%	2	25.00%
Smooth/hard	13	13.98%	11	33.33%	5	31.25%	4	50.00%
Pitted/heavily pitted	2	2.15%	2	6.06%	0		2	25.00%
	93		33		16		8	

Table 10-27: Attribute analysis of platform blades from Powbrone.

Powbrone	Chert	%	Flint	%	Quartz	%	Qz	%
Dorsal Scarring Pattern								
Absent	1	1.08%	0		5	31.25%	1	12.50%
Longitudinal	31	33.33%	23	69.70%	7	43.75%	3	37.50%
Opposed	23	24.73%	6	18.18%	1	6.25%	1	12.50%
Crossed	6	6.45%	1	3.03%	0		2	25.00%
Multi-directional	32	34.41%	3	9.09%	3	18.75%	1	12.50%
	93		33		16		8	
Dorsal Surface								
Absent	80	86.02%	28	84.85%	15	93.75%	7	87.50%
Step	5	5.38%	4	12.12%	1	6.25%	1	12.50%
Hinge	4	4.30%	1	3.03%	0		0	
Step & hinge	4	4.30%	0		0		0	
	93		33		16		8	
Platform Preparation								
Indeterminate	32	34.41%	14	42.43%	4	25.00%	4	50.00%
Cortical	7	7.53%	1	3.03%	4	25.00%	3	37.50%
Plain/simple	36	38.71%	11	33.33%	8	50.00%	1	12.50%
Plain with dorsal trimming	11	11.82%	4	12.12%	0		0	
Plain w/isolated trimming	7	7.53%	3	9.09%	0		0	
	93		33		16		8	
Remaining Platform Size								
Indeterminate	30	32.26%	10	30.31%	8	50.00%	5	62.50%
Point only	45	48.39%	11	33.33%	7	43.75%	2	25.00%
Small/narrow	7	7.53%	4	12.12%	0		0	
Small/wide	2	2.15%	2	6.06%	1	6.25%	0	
Broad/narrow	1	1.07%	2	6.06%	0		0	
Large	6	6.45%	4	12.12%	0		1	12.50%
Crushed	2	2.15%	0		0		0	
	93		33		16		8	
Anvil Supported	7	7.53%	5	15.15%	1	6.25%	3	37.50%
Colour								
Greenish greys	71	78.89%	0		0		0	
Greys	14	15.56%	19	65.52%	0		2	40.00%
Black	1	1.11%	0		0		0	
Browns	4	4.44%	9	31.03%	0		1	20.00%
White	0		0		14	100.00%	0	
Reds	0		1	3.45%	0		2	40.00%
	90		29		14		5	

Table 10-28: Continuation of the attribute analysis of platform blades from Powbrone.

Loch Doon				
Platform blades	**Chert**	**%**	**Flint**	**%**
Fragmentation Patterns				
Complete	6	31.58%	12	63.16%
Proximal missing	4	21.05%		
Distal missing	3	15.79%	2	10.53%
Medial fragment	3	15.79%	4	21.05%
Split/truncated width	1	5.26%		
Proximal spalling	2	10.53%	1	5.26%
	19	100%	19	100%
Distal Termination				
Abrupt	4	21.05%	10	52.63%
Hinge	4	21.05%	3	15.79%
Plunging	1	5.26%		
Feathered	8	42.11%	3	15.79%
Crushed			3	15.79%
Jagged/irregular	2	10.53%		
	19	100%	19	100%
Bulb Types				
Absent	7	36.84%	4	21.05%
Pronounced	2	10.53%	2	10.53%
Diffuse	9	47.37%	13	68.42%
Bulb with lip	1	5.26%		
	19	100%	19	100%
Location of Cortex				
Absent	18	94.74%	13	68.42%
Distal			2	10.53%
Lateral left			2	10.53%
Lateral right	1	5.26%		
Combination			2	10.52%
	19	100%	19	100%
Cortex Type				
Absent	18	94.74%	13	68.42%
Smooth/chalky			6	31.58%
Smooth/hard	1	5.26%		
	19	100%	19	100%

Loch Doon				
	Chert	**%**	**Flint**	**%**
Dorsal Scarring Pattern				
Absent				
Longitudinal	12	63.16%	17	89.47%
Opposed	7	36.84%	2	10.53%
	19	100%	19	100%
Dorsal Surface				
Absent	13	68.42%	15	79.95%
Step	6	31.58%	4	21.05%
	19	100%	19	100%
Platform Preparation				
Indeterminate	7	36.84%	4	21.05%
Plain/simple	7	36.84%	6	31.58%
Plain w/scrub preparation			4	21.05%
Plain w/isolated scrub	5	26.32%	5	26.32%
	19	100%	19	100%
Remaining Platform Size				
Indeterminate	7	36.85%	4	21.05%
Point only	1	5.26%	2	10.53%
Small/narrow	4	21.05%	6	31.57%
Small/wide	3	15.79%		
Broad/narrow	4	21.05%	5	26.32%
Large			2	10.53%
	19	100%	19	100%
Colour				
Greenish greys	10	52.62%		
Greys	7	36.85%	15	83.33%
Browns	2	10.53%	2	11.11%
Reds			1	5.56%
	19	100%	18	100%
Anvil Supported	0		0	

Table 10-29: Attribute analysis of chert and flint platform blades from Loch Doon.

Glossary of terms

11.1 Introduction

The definitions of terms is a composite from a number of different sources, i.e. Wickham-Jones 1990; Inizan *et al*. 1999; Finlayson *et al*. 2000; and Wickham-Jones 2004a. If other sources are used then the relevant section is referenced accordingly.

11.2 Glossary

Anvil: These coarse stone artefacts are recognised by distinctive wear patterns (Clarke 1990, Illustration 78). They may have also used as percussors (Finlayson *et al*. 2000, 72).

Anvil support: Refers to those occasions where the platform core is placed on an anvil for support to facilitate blank removals.

Blade: A blade is arbitrarily defined as an artefact which is twice as long as it is wide usually with straight parallel sides. Such examples may sometimes be referred to as 'true blades' to distinguish them (Wickham-Jones 2004a, 69).

> **Blade-like flakes:** The blade fits the metric parameters to be categorised as such, however, the morphology of the piece in more in keeping with that of flakes, e.g. they may often be irregular and do not have parallel sides.

Blanks: Collective term for blades and flakes (Wickham-Jones 20004a, 69).

Bulb of percussion: This attribute signifies where the core was struck to detach the blank. A pronounced bulb may indicate the use of a hard hammer, and a diffuse bulb invariably indicates the use of a softer hammer (Wickham –Jones 2004a, 69). Bulb and lip, lip and pronounced lips are associated with the use of soft hammer. Lip attributes may suggest the use of an antler percussor (Madsen 1992, 104-105). Experimental studies confirm this, although such studies are usually undertaken using flint of exceptional quality (cf. Ohnuma and Bergman 1982). Bulb attributes will vary with different raw materials (cf. Costa *et al.* 2005). There are very few lip attributes in the assemblages. The quality of the raw materials within the assemblages and the associated attributes suggest the use of a soft hammerstone.

Chunk: These artefacts are generally a by-product, and do not have a platform or ventral face. Some chunks may have been used, e.g. *pièces esquillèes* (Wickham-Jones 2004a, 69).

Cores: The core is the artefact from which blades and flakes are struck.

Bipolar cores: Indicates that cores are worked utilising an anvil. They may present with removals from both the proximal and distal ends due to the strike of the hammerstone and the shock reverberation from the anvil, and there may be evidence of severe crushing damage, percussion ridges from repeated strikes, step and hinge terminations and the presence of cortex (Hayden 1981, 3).

Platform cores: The term refers to the utilisation of a plain or simple platform which is struck to detach blades and flakes. These cores can be predominantly for either blade or flake production. A distinction that is ascertained by determining the most common form of blank removed. Some cores will be classified as non-specific platform referring to the removal of blades and flakes in broadly equal frequencies. The remaining category is for cores described as amorphous which represent irregular knapping sequences (Wickham-Jones 2004a, 70; Finlayson *et al.* 2000, Table 2.5.3).

Core rejuvenation strategies: Knapping accidents will occur resulting in negative step and/or hinge terminations on the flaking surface of the core, which may be removed by a core rejuvenation blank to leave a clear flaking surface for future removals. Accumulations of material at the distal end of the core can be removed by the blank with a plunging termination. Strategies are also encountered when part of the platform surface is removed by a side blow (after Inizan *et al.* 1999, 153).

Cortex: Refers to the original surface of the nodule or pebble, which may be fresh, rolled, abraded, pitted or battered. Cortex may be either smooth/chalky or smooth/hard. The cortical attribute may indicate the possible source of the raw material (Wickham-Jones 2004 a, 69).

Edge damage: Edge damage may result from the reduction strategy, use and other post-depositional factors such as ploughing, trampling, natural abrasion, and other unknown taphonomic processes (Finlayson *et al*. 2000 Table 2.5.1; McBrearty *et al*. 1998; Mallouf 1992; Neilsen 1991).

Flake: A classification of a blank. Metric variants distinguish flakes from blades. Flakes are also generally less regular than blades. They may be either modified or unmodified for use (Wickham-Jones 2004a, 69).

Hammerstone: Hammerstones vary in hardness which may be indicated by the bulb of percussion on blanks, and the negative bulb of percussion visible on cores (Wickham-Jones 2004a, 69-70).

***Languette*:** Represents a knapping error creating tongue-like distal termination. They are associated with a soft hammer (Inizan 1999 *et al*., 144).

***Lamellar* index:** The arbitrary index defines the presence of a blade industry based on the ratio of blades to flakes (Bordes and Gaussen 1970).

Microliths: Microliths are small tool forms which are generally fashioned on blades by blunting to the edge(s) by retouch (cf. Finlayson *et al*. 2000, Table 2.5.6). The majority of microliths have a thickness of 1-2m and, therefore, the removal of the bulb of percussion is not a pre-requisite to microlith manufacture.

> **Backed bladelets:** One side is blunted by retouch which is usually straight, and they are generally rectangular with a triangular cross-section.

> **Double backed bladelets:** Opposed straight sides are blunted by retouch.

Crescent: Convex backed edge which is blunted by retouch.

Scalene triangle: Comprises of a minimum of two edges with continuous retouch; one long edge and oblique truncated edge.

Triangle: An isosceles triangle in plan with retouch to a minimum of two contiguous edges.

Trapeze: Trapezoidal in plan with one side and both obliquely truncated ends blunted by retouch.

Needle point: Two sides with retouch converging to point.

Leaf point: Retouch to two sides producing convex curved sides.

Indeterminate: Artefact with microlithic retouch which do not fit within other categories.

Original pebble/nodule size: A medium sized pebble has been categorised as fist-sized. An approximate term based in the size of pebbles recorded on Islay (Finlayson *et al*. 2000, Table 2.5.2).

Patination: Discolouration of original fresh colour artefacts. Variations in patination may arise because of the nature of the soil matrix from which they were recovered. It may also indicate ground disturbance (Inizan *et al*. 1999, 147; Wickham-Jones 2004a, 69).

***Piquant-triedre*:** Refers to a sharp oblique truncation to the proximal or distal end indicating the use of the microburin technique (Inizan et al 1999, 149).

Platform type: There are four types of platform referred to (Finlayson *et al*. 2000, Table 2.5.4).

Cortical: The entire blank platform is covered in cortex.

Simple/plain: Represented by a simple flaked surface.

Complex/faceted: Multiple flake removals define this form of platform. Examples of this strategy during the Mesolithic period are likely to be accidental.

Crushed: A collapsed platform associated with bipolar reduction.

Primary material: Cortex covers the dorsal surface of the artefact (Wickham-Jones 2004a, 70).

Primary technology: Refers to the procurement of raw material, preparation of cores and debitage products, such as blades, flakes, chunks and small fraction debitage (Wickham –Jones 2004a, 70).

Reduction strategy: Refers to the use of either bipolar or platform reduction strategies (Wickham-Jones 2004a, 71).

Regular/irregular blanks: Regularity is determined by a blank with a straight edge <10mm. Blanks with a straight edge of <10mm are classified as irregular (Wickham-Jones 2004a, 71).

Remaining platform size: This schema is taken from Madsen (1992, Figure 70).

Point: Where remaining platform represents <33.33% of blank width.

Small/narrow: Remaining platform width is c.33.33% of blank and length is <33.33% and >66.67%.

Broad/narrow: Remaining platform length is >66.67% of blank.

Large: The width and length of the remaining platform is >66.67%.

Retouch, angle of: There are four forms of retouch referred to in this study (cf. Inizan *et al.* 1999, 129-130; Woodman *et al.* 2006, 95). The first three categories are focused on the edge of the blank.

Abrupt: Marginally less than 90˚.

Enclume: Use of anvil with angle at 90°.

Semi-abrupt: angle at approximately 45°.

Semi-invasive: Similar to semi-abrupt, although retouch extends across the surface of the blank

Secondary material: Artefact with cortex visible on the dorsal surface (Wickham-Jones 2004a, 71).

Secondary technology: Refers to the modification of blanks into tools (Wickham-Jones 2004a, 71).

Scrapers: Scrapers present with a blunt working edge (cf. Finlayson *et al*. 2000, Table 2.5.8).

Short convex: Convex scraping edge <10mm thick.

Short convex flared: As for short convex but where artefact narrows from scraping edge.

Short thick convex: As for short convex with scraping edge <10mm.

Short thick convex flared: As for short thick convex but flared.

Long convex: Scraper which is twice as long as it is wide with a scraping edge of <10mm.

Long convex flared: As for long convex but flared.

Long thick convex flared: Scraper which is twice as long as it is wide with a scraping edge of >10mm.

Disc: Continuous retouch to circumference of scraper.

Concave: Scraper with concave scraping edge.

Denticulate: Scraping edge is denticulated or presents with multiple notches.

Angled: A scraper with more than one scraping edge which meets to form an angled corner(s).

Sub-angled: As for angled but with rounded corners.

Straight: The edge is neither convex nor concave in plan.

Wide convex: A side scraper with retouch to longest axis.

Irregular: Scrapers which do not into the other classifications.

Fragment: Refers to a scraper fragment.

***Siret* fracture:** Refers to a knapping error where the width of the blank is split. This may or not extend the full length of the blank (Inizan *et al.* 1999, 156).

Small fraction debitage: Debitage where metric variants are all <10mm (Finlayson *et al.* 2000, Table 2.5.5).

Tertiary material: Artefact without any trace of the original cortical surface present (Wickham-Jones 2004a, 70).

Tool form types: General term for all tool forms. Apart from microliths and scrapers other tool forms are set out below (cf. Finlayson *et al.* 2000, Table 2.5.1).

Abruptly backed: Any artefact which has abrupt retouch to blunt edge.

Thin-backed: Refers to any artefact with fine retouch to blunt edge.

Point: Two or more convergent edges with retouch.

Denticulate: Edge is formed as a series of notches. Each notch may be as a result of single or multiple removals.

Thick denticulate: As for denticulate but where modified edge is >10mm.

Notch: Artefact with non-contiguous notch attributes. The notch may be as a result of single or multiple removals.

Miscellaneous retouch: Artefact with retouch that do not fit into any of the other categories.

Awl: Generally awls are fashioned on thick blanks and comprise of abrupt retouch on two sides to form point.

Trimming: Relates to the abrasion of an unretouched edge producing semi-invasive scalar removals. Associated with shaping of artefacts.

Truncations: Truncations are divided into five typological classifications (cf. Finlayson *et al*. 2000, Table 2.5.7).

Oblique truncation: Blank with diagonal retouch across the width.

Microburin: Debitage product from the manufacture of microliths. A notch is prepared by microlithic retouch to the facilitate truncation of the artefact by a simple strike.

***Lamelle à cran*:** Retouch to one end and one side which is concave in plan.

Microlithic truncation: An oblique truncation with proximal removed and microlithic retouch.

Notch and snap: Similar to microburin but where snap is a result of a blow to face of blank.

Bibliography

12.1 Key to abbreviations

DES	Discovery and Excavation in Scotland
GAJ	Glasgow Archaeological Journal
PPS	Proceedings of the Prehistoric Society
PSAS	Proceedings of the Society of Antiquaries of Scotland
SAIR	Scottish Archaeological Internet Reports
SAJ	Scottish Archaeological Journal
SAR	Scottish Archaeological Review
TDGNHAS	Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society

---

12.2 Bibliographic references

Abernethy, D.
1996 Girvan Mains. *DES*: 97.

Affleck, T.L.
1983 Clatteringshaws Loch, Loch Dee, Moniaive and Smittons (Carsphairn). *DES*: 4-6.

1984 Clatteringshaws Loch and Loch Dee; Starr 1, Straiton and Loch Doon, Dalmellington. *DES*: 6, 33-34.

1985 Excavation at Starr 1, Loch Doon; *Glasgow Archaeological Society Bulletin* 20: 4-6.

1985a Starr 1, Carsphain; Starr 1, Straiton. *DES*: 11, 49.

1986 Excavation at Starr, Loch Doon 1985. *Glasgow Archaeological Society Bulletin* 22: 10-21.

1986a Garleffin, Ballantrae. Unpublished manuscript.

Affleck, T.L., K.J. Edwards and A. Clark
1988 Archaeological and palynological studies at the Mesolithic pitchstone and flint site of Auchareoch, Isle of Arran. *PSAS* 118: 37-59.

Alexander, D.
1996 Sites and Artefacts: the Prehistory of Renfrewshire. In D. Alexander (ed.), *Prehistoric Renfrewshire: Papers in Honour of Frank Newell*, 5-22. Edinburgh: Renfrewshire Local History Forum.

Allen, C. and K.J. Edwards
1987 The distribution of lithic materials of possible Mesolithic age on the Isle of Arran. *GAJ* 14: 19-24.

Allen, M.
1991 Analysing the landscape: a geographical approach to archaeological problems. In A.J. Schofield (ed.), 39-58. Oxford: Oxbow.

Althusser, L.
1984 *Essays on Ideology*. London: Verso.

Altman, J. and N. Peterson
1988 Rights to game and rights to cash among contemporary Australian hunter-gatherers. In T. Ingold, D. Riches and J. Woodburn (eds.) 1988a, 75-94. Oxford: Berg.

Anderson, J.
1895 Notice of a cave recently discovered at Oban, containing human remains, and a refuse-heap of shells and bones of animals, and stone and bone implements. *PSAS* 29: 211-230.

Andrefsky, W.
1998 *Lithics: Macroscopic approaches to analysis*, Cambridge: Cambridge University Press.

Ansell, M.L.
1968 Starr; Loch Doon, Loch Head and Portmark. *DES*: 13, 24.

1969 Donald's Isle; Starr; Black Craig, Loch Doon; High Bridge of Ken; Loch Doon, Loch Head; Smeeton. *DES*: 11-12; 31.

Apel, J. and K. Knutsson (eds.)
2006 *Skilled Production and Social Reproduction: Aspects of Traditional Stone-Tool Technologies*. Uppsala: SAU.

Appadurai, A. (ed.)
1986 *The Social Life of Things: Commodities in cultural perspective*. Cambridge: Cambridge University Press.

Appadurai, A.
1986a Toward an anthropology of things. Introduction: commodities and the politics of value. In A. Appadurai (ed.), 3-63. Cambridge: Cambridge University Press.

Archer, E.
1985 Cornhill; Lanark Racecourse. *DES*: 41.

2000 Charleston Farm. *DES*: 87-88.

Archer, E. and I. Borthwick
1999 Green's Farm. *DES*: 83.

Archer, E. and P. Taylor
1987 Lang Wang. *DES*: 44.

Archer, E.P.
1998 Parkgatestone Hill; North Deanhead, Dunsyre. *DES*: 79, 90.

Armstrong, H.A., A.W. Owen and J.D. Floyd
1999 Rare earth geochemistry of Arenig cherts from the Ballantrae Ophiolite and Leadhills Imbricate Zone, southern Scotland: implications for origin and significance to the Caledonian Orogeny. *Journal of the Geological Society* 156: 549-560.

Arthur, W.B.
2005 The Changing Character of Technology. In Ö. D. Jònsson and E. H. Huijbens (eds.), 191-200. Reykjavik: University of Iceland Press.

Ashmore, P.
2004 A Date List (to October 2002) for Early foragers in Scotland. In A. Saville (ed.), 95-157. Edinburgh: Society of Antiquaries of Scotland.

Ashmore, P. And C.R. Wickham-Jones
2007 Scotland's First Settlers: radiocarbon determinations in context. In K. Hardy and C. R. Wickham-Jones (eds.) *SAIR* 31 (http://www.sair.org.uk/sair31/). Last viewed 4th July 2011.

Ashton, N., F. Healy and P. Pettitt (eds.)
1998 *Stone Age Archaeology: Essays in honour of John Wymer*. Oxford: Oxbow.

Åstveit, L.I.
2009 Different ways of building, different ways of living: Mesolithic house structures in western Norway. In S.B. McCartan, R. Schulting, G. Warren and P.C. Woodman (eds.), 414-421. Oxford: Oxbow.

Atkinson, J., M. Donnelly and G. MacGregor
1997 Ben Lawers Historic Landscape Project. *DES*: 63.

Atkinson, J., M. Donnelly, O. Lelong and G. MacGregor
1999 Ben Lawers Historic Landscape Project, the final pilot season. Glasgow: GUARD.

Atkinson, R.J.C.
1962 Fishermen and Farmers. In S. Piggott (ed.), *The Prehistoric Peoples of Scotland*, 1-38. London: Routledge and Kegan Paul.

Aubry, T., F. Almeida, A.C. Araújo and M. Tiffagom (eds.)
2008 *Space and Time: Which Diachronies, Which Synchronies, Which Scales? and Typology vs Technology*. Oxford: BAR.

Bailey, G. (ed.)
1983 *Hunter-Gatherer Economy in Prehistory: A European Perspective*. Cambridge: Cambridge University Press.

Bailey, G.
1983a Hunter-Gatherer Behaviour in Prehistory: Problems and Perspectives. In G. Bailey (ed.), 1-10. Cambridge: Cambridge University Press.

2007 Time Perspectives, Palimpsests and the Archaeology of Time. *Journal of Anthropological Archaeology* 26: 198-223.

2008 Mesolithic Europe: Overview and New Problems. In G. Bailey and P. Spikins (eds.), 357-371. Cambridge: Cambridge University Press.

Bailey, G. and P. Spikins (eds.)
2008 *Mesolithic Europe*. Cambridge: Cambridge University Press.

Baker, F.
1999 Bridge Farm, Machrie Moor, Arran. *DES*: 65.

Ballantyne, C.K.
2004 After the Ice: Paraglacial and Postglacial Evolution of the Physical Environment of Scotland, 20,000 to 5000 BP. In A. Saville (ed.), 27-43. Edinburgh: Society of Antiquaries of Scotland.

Ballantyne, C.K. and A.G. Dawson
2003 [1997] Geomorphology and Landscape Change. In K.J. Edwards and I.B.M. Ralston (eds.), 23-44. Edinburgh: Edinburgh University Press.

Ballin, T.B.
2000 Classification & Description of Lithic Artefacts: a Discussion of the Basic Lithic Terminology. *Lithics* 21: 9-15.

2004 The lithic assemblage from Chest of Dee, Crathie and Braemar, Aberdeenshire. Unpublished report.

2008 Quartz Technology in Scottish Prehistory. *SAIR* 26 (http://www.sair.org.uk/sair26/). Last viewed 6th July 2011.

2009 *Archaeological Pitchstone in Northern Britain. Characterization and interpretation of an important prehistoric source*. Oxford: Archaeopress.

2011 The Lithic Artefacts. In I. Suddaby and T.B. Ballin (eds.) Late Neolithic and Late Bronze Age assemblages associated with a cairn and other prehistoric features at Stoneyhill Farm, Longhaven, Peterhead, Aberdeenshire, 2002-03, 25-43. *SAIR* 45 (http://www.sair.org.uk/sair45/). Last viewed 17th September 2011.

Forthcoming The Lithic Assemblage. In G. MacGregor (ed.). Edinburgh: Society of Antiquaries of Scotland.

Ballin, T.B. and J. Faithfull
2009 Gazetteer of Arran Pitchstone Sources: Presentation of exposed pitchstone dykes and sills across the Isle of Arran, and discussion of the archaeological relevance of these outcrops. *SAIR* 38 (http://www.sair.org.uk/sair38/). Last viewed 4th July 2011.

Ballin, T.B. and M. Johnson
2005 Glentaggart, South Lanarkshire: Discussion of a Scottish Chert Assemblage and its Associated Technology. *Lithics: The Journal of the Lithic Studies Society* 26: 57-86.

Ballin, T.B. and A. Saville
2003 An Ahrensburgian-type tanged point from Shieldaig, Wester Ross, Scotland, and its implications. *Oxford Journal of Archaeology* 22(2): 115-131.

Ballin, T.B., A. Saville, R. Tipping and T. Ward
2010 An Upper Palaeolithic Flint and Chert Assemblage from Howburn Farm, South Lanarkshire, Scotland: First Results. *Oxford Journal of Archaeology* 29: 323-360.

Ballin, T.B., R. White, P. Richardson and T. Neighbour
2010 An early Mesolithic stone tool assemblage from Clachan Harbour, Raasay, Scottish Hebrides. *Lithics* 31: 94-104.

Ballin-Smith, B., M. Donnelly and K. McLellan
1999 Arran Pipeline Phase 1. *DES*: 64.

Banks, I., P.R.J. Duffy and G. MacGregor
2008 Archaeology of Landscape Change in South-West Scotland, 6000BC-AD1400: Excavations at William Grant and Sons Distillery, Girvan. Scottish Archaeological Internet Report 32 (www.sair.org.uk).

Banning, E.B.
2000 *The Archaeologist's Laboratory: The Analysis of Archaeological Data*. New York: London: Kluwer Academic: Plenum Publishers.

Bapty, I. and T. Yates (eds.)
1990 *Archaeology After Structuralism*. London: Routledge.

Barad, K.
2006 *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press.

Barber, J.W. (ed.)
1997 *The Archaeological Investigation of a Prehistoric Landscape: Excavations on Arran 1978-1981*. Edinburgh: Scottish Trust for Archaeological Research (Monograph 2).

Barrett, J.C.
1992 Comment. *Archaeological Review from Cambridge* 11(1): 157-162.

2001 Agency, the Duality of Structure, and the Problem of the Archaeological Record. In I. Hodder (ed.). Cambridge: Polity Press.

Barrowman, C.
1998 Garvald Burn. *DES*: 80.

2000 Surface Lithic Scatters as an Archaeological Resource in South and Central Scotland. University of Glasgow: Unpublished PhD thesis.

2000a Garvald Burn. *DES*: 77.

2003 Lithic Scatters and Dynamic Archaeology. In N. Moloney and M.J. Shott (eds.), *Lithic Analysis at the Millennium*, 99-102. London: Institute of Archaeology, UCL.

Forthcoming An Early Mesolithic assemblage from Weston near Biggar, South Lanarkshire.

nd. Weston: Test pit survey. Unpublished manuscript.

Barrowman, C. and E. Stuart
Forthcoming Scottish Lithic Scatters Project. SCARF.

Barth, F. (ed.)
1998 [1969] *Ethnic Groups and Boundaries: the Social Organization of Culture Difference*. Prospect Heights: Waveland Press.

1998a [1969] Introduction. In F. Barth (ed.), 9-38. Prospect Heights: Waveland Press.

Bartholomew, J.G. (ed.)
1895 *Atlas of Scotland*. Edinburgh: Edinburgh Geographical Institute.

Barton, R.N.E., P.J. Berridge, M.J.C. Walker and R.E. Bevins
1995 Persistent Places in the Mesolithic Landscape: an example from the Black Mountain uplands of South Wales. *Proceedings of the Prehistoric Society* 61: 81-116.

Barton, R.N.E. and A.J. Roberts
1996 Reviewing the British late Upper Palaeolithic: new evidence for chronological patterning in the Late Glacial record. *Oxford Journal of Archaeology* 15(3): 245-265.

2004 The Mesolithic Period in England: Current Perspectives and New Research. In A. Saville (ed.), 339-358. Edinburgh: Society of Antiquaries of Scotland.

Bassala, G.
1988 *The Evolution of Technology*. Cambridge: Cambridge University Press.

Bauman, Z.
1992 *Intimations of Postmodernity*. London: Routledge.

Bayliss, A. and P.C. Woodman
2009 A new bayesian chronology for Mesolithic occupation at Mount Sandel, Northern Ireland. *PPS*: 101-123.

Becket, A., F. Charlotte and G. MacGregor
Forthcoming A Forgotten yet Memorable Place: Prehistoric occupation at Warehouse 37, William Grants Distillery, Girvan, South Ayrshire.

Bell, J.A. and C. Colebrook (eds.)
2009 *Deleuze and History*. Edinburgh: Edinburgh University Press.

Bender, B.
1978 Gatherer-hunter to farmer: a social perspective. *World Archaeology* 10: 204-222.

Bevan, L.
2003 Stag nights and horny men: antler symbolism and interaction with the animal world during the Mesolithic. In L. Bevan and J. Moore (eds.), 35-44. Oxford: BAR.

Bevan, L. and J. Moore (eds.)
2003 *Peopling the Mesolithic in a Northern Environment*. Oxford: BAR.

Biggar Archaeology Group
2010 Biggar Gap Project. Biggar Museum Trust (http://www.biggararchaeology.org.uk/mp_biggargap.shtml). Last viewed 7th June 2011.

2010a Daer [86]: A progress report. Biggar Museum Trust (http://www.biggararchaeology.org.uk/news19_220710.shtml). Last viewed 7th June 2011.

2010b The Mesolithic to Neolithic transition – have we got it? [Daer 89]. Biggar Museum Trust (http://www.biggararchaeology.org.uk/news22_311010.shtml). Last viewed 7th June 2011.

2010c Daer excavation: latest report. (http://www.biggararchaeology.org.uk/news21_190810.shtml). Last viewed 20th June 2011.

Binford, L.R.
1965 Archaeological Systematics and the Study of Culture Process. *American Antiquity* 31(2): 203-210.

1966 A Preliminary Analysis of functional Variability in the Mousterian of Levallois Facies. *American Anthropologist* 68: 238-259.

1968 Methodological Considerations of the Archaeological Use of Ethnographic Data. In R.B. Lee and I. De Vore (eds.), 268-273. Chicago: Aldine.

1978 *Nunamiut Ethnoarchaeology*. New York: Academic Press.

1979 Organisation and formation processes: looking at curated technologies. *Journal of Anthropological Research* 35: 255-273.

1980 Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1): 4-20.

1982 The archaeology of place. *Journal of Anthropological Archaeology* 1: 5-31.

Birks, H.H.
1972 Studies in the vegetational history of Scotland, II. Two pollen diagrams

from the Galloway Hills, Kircudbrightshire. *Journal of Ecology* 60: 183-217.

1975 Studies in the vegetational history of Scotland, IV: pine stumps in blanket peat. *Philosophical Transactions of the Royal Society* B270: 181-226.

Bishop, A.H.
1914 An Oransay Shell Mound – a Scottish pre-Neolithic site. *PSAS* 48; 52-108.

Bjerck, H.B.
2008 Norwegian Mesolithic Trends: A Review. In G. Bailey and P. Spikins (eds.), 60-106. Cambridge: Cambridge University Press.

Blackford, J.J., J.B. Innes, P. Ryan and P.A. Rowley-Conwy
2008 Chronology and Ecology of later Mesolithic disturbance episodes in North West Europe: adoption of new ideas in prehistory and in contemporary archaeology. Unpublished lecture delivered by J.J. Blackford at TAG 2008 on 16th December 2008: University of Manchester and University of Durham.

Blankholm, H.P.
2008 Southern Scandinavia. In G. Bailey and P. Spikins (eds.), 107-131. Cambridge: Cambridge University Press.

Blumfiel, E.M.
1991 Distinguished Lecture in Archaeology: breaking and Entering the Ecosystem: Gender, Class, and Faction Steal the Show. *American Anthropologist* 94(3): 551-567.

Bonsall, C. (ed.)
1989 *The Mesolithic in Europe: Papers Presented at the Third International Symposium, Edinburgh 1985*. Edinburgh: John Donald Publishers Ltd.

Bonsall, C.
1988 Morton and Lussa Wood, the case for early Flandrian settlement of Scotland: comment on Myers. *Scottish Archaeological Review* 5: 33-38.

1997 Coastal Adaptation in the Mesolithic of Argyll. Rethinking the 'Obanian Problem'. In G. Ritchie (ed.), 25-37. Edinburgh: Edinburgh University Press.

Bonsall, C., G. Cook, C. Pickard, K. McSweeney and L. Bartosiewicz
2009 Dietary trends at the Mesolithic-Neolithic Transition in North-West Europe. In P. Crombé, M. van Strydonck, J. Sergant, M. Boudin and M. Bats (eds.), 517-539. Newcastle upon Tyne: Cambridge Scholars.

Bonsall, C., M.G. Macklin, D.E. Anderson and R.W. Payton
2002 Climate change and the adoption of agriculture in north-west Europe. *European Journal of Archaeology* 5(1): 9-23.

Bonsall, C. and C. Smith
1990 Bone and antler technology in the British Late Upper Palaeolithic and Mesolithic: the impact of accelerator dating. In P. M. Vermeesch and P.

Van Peer (eds.), 359-368. Leuven: Leuven University Press.

1992 New AMS 14C dates for antler and bone artifacts from Great Britain. *Mesolithic Miscellany* 13(2): 28-34.

Bordes, F. and J. Gaussen
1970 *Une fonde du tente magdalénien près de Mussidan (Dordogne)*. Köln: Frühe Menschheit Und Umwelt 1.

Borrero, L.A.
1997 The Origins of Ethnographic Subsistance Patterns in Fuego-Patagonia. In C. McEwan, L. A. Borrero and A. Prieto (eds.), 60-81. London: British Museum Press.

Bourdieu, P.
1977 [1972] *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.

1990 [1980] *The Logic of Practice*. Stanford: Stanford University Press.

Boyd, W.
1982 Archaeological implications of a new palaeoenvironmental model for part of the Ayrshire coast. *Glasgow Archaeological Journal* 9: 15-17.

Boyle, K.V.
2009 Review: Mesolithic Europe edited by G. Bailey and P. Spikins. *Cambridge Archaeological Journal* 19(2): 258-259.

Bradley, R.
2000 *An Archaeology of Natural Places*. London: Routledge.

2003 Seeing Things: Perception, Experience and the Constraints of Excavation. *Journal of Social Archaeology* 3: 151-168.

Brinch Petersen, E.
1973 A survey of the Late Palaeolithic and Mesolithic of Denmark. In S.K. Kozlowski (ed.). *The Mesolithic in Europe. Papers read at the International Archaeological Symposium on the Mesolithic in Europe*, 77-127. Warsaw: Warsaw University Press.

British Geological Survey
1993 *Regional geochemistry of southern Scotland and part of northern England*. Keyworth, Nottingham: British Geological Survey.

Briz Godino, I., M. Álvarez, A. Balbo, D. Zurro, M. Mardella, X. Villagrán and C. Fresh
2011 Towards high resolution shell midden archaeology: Experimental and ethnoarchaeology in Tierra del Fuego (Argentina). *Quaternary International* 239: 125-134.

Broadbent, N.
1979 *Coastal Resources and Settlement Stability. A critical study of a Mesolithic Site Complex in Northern Sweden*. Aun 3. Uppsala.

Brody, H.
2002 [1981] *Maps and Dreams*. London: Faber and Faber.

Bronk Ramsey, C.
1995 Radiocarbon calibration and analysis of stratigraphy: The OxCal program. Radiocarbon 37(2): 425-430.

2000 OxCal 3.5 (www.rlaha.ox.ac.uk/orau.html).

2011 OxCal 4.1 (https://c14.arch.ox.ac.uk/oxcal/OxCal.html).

Brück, J.
1999 Ritual and Rationality: Some Problems of Interpretation in European Archaeology. *European Journal of Archaeology* 2(3): 313-344.

Brumfiel, E.M.
1991 Distinguished Lecture in Archaeology: Breaking and Entering the Ecosystem: Gender, Class and Faction Steal the Show. *American Anthropologist* 94(3): 551-567.

Buchanan, I.
2008 *Deleuze and Guattari's Anti-Oedipus: A Reader's Guide*. London: Continuum.

Buchli, V.
1995 Interpreting Material Culture: The Trouble with Text. In I. Hodder, M. Shanks, A. Alexandri, V. Buchli, J. Carman, J. Last and G. Lucas (eds.), 181-193. London: Routledge.

Burke, P.J. and J.E. Stets
1999 Trust and Commitment Through Self-Verification. *Social Psychology Quarterly* 62(3): 347-366.

Burl, A.
1980 Machrie Moor, Arran, Argyle, Strathclyde. *Proceedings of the Prehistoric Society* 46: 365.

Callahan, E.
1987 *An Evaluation of the Lithic Technology in Middle Sweden during the Mesolithic and Neolithic*. Uppsala: Societas Archaeologica Upsaliensis.

Callandar, J.G.
1911 Notice of the discovery of two vessels of clay on the Culbin Sands, the first containing Wheat and the second from a Kitchen-Midden, with a comparison of the Culbin Sands and the Glenluce Sands and of the relics found on them. *PSAS* 45: 158-181.

1917 A Flint Workshop on the Hill of Skares, Aberdeenshire. *PSAS* 51: 117-127.

1927 A collection of Tardenoisian implements from Berwickshire. *PSAS* 61: 318-327.

1929 Land Movements in Scotland in Prehistoric and Recent Times. *PSAS* 63: 314-322.

Cameron, K.
2000 Monkton. *DES*: 84.

Campbell, J.M.
1968 Territoriality amongst ancient hunters: Interpretations from ethnography and nature. In B. Meggars (ed.) *Anthropological and Archaeology in the Americas*, 1-21. Washington: Anthropological Society of Washington.

CFA
1991 Crookedstane Farm. *DES*: 64.

Chapman, A.
1997 The Great Ceremonies of the Selk'nam and the Yamana. In C. McEwan, L. A. Borrero and A. Prieto (eds.), 82-109. London: British Museum Press.

Chapman, J.
2000 *Fragmentation in Archaeology: People, places and broken objects in the prehistory of south-eastern Europe*. London: Routledge.

Charlesworth, J.K.
1926 The glacial geology of the southern uplands of Scotland, West Annandale and Upper Clydesdale. *Transactions of the Royal Society of Edinburgh* 40: 1-23.

Chatterton, R.
2003 Star Carr reanalysed. In L. Bevan and J. Moore (eds.), 69-80. Oxford: BAR.

2006 Ritual. In C.J. Conneller and G. Warren (eds.), 101-120. Stroud: Tempus.

Cherry, J., C. Scarre and S. Shennan (eds.)
2004 *Explaining Social Change: studies in honour of Colin Renfrew*. Cambridge: McDonald Institute for Archaeological Research.

Cherry, J.F.
1978 Questions of Efficiency and Integration in Assemblage Sampling. In J.F. Cherry, C. Gamble and S. Shennan (eds.), 293-320. Oxford: BAR.

Cherry, J.F., C. Gamble and S. Shennan (eds.)
1978 *Sampling in Contemporary British Archaeology*. Oxford: BAR.

Childe, V.G.
1925 *The Dawn of European Civilization*. London: Routledge and Keegan Paul Ltd.

1935 *The Prehistory of Scotland*. London: Kegan Paul, Trench, Trubner.

Clark, J.D.G.
1952 *Prehistoric Europe. The Economic Basis*. London: Methuen.

1953 The economic Approach to Prehistory. *Proceedings of the British Academy*

39: 215-238.

1956 Notes on the Obanian with special reference to Antler and Bone-Work. *PSAS* 84: 91-106.

1972 *Star Carr: a case study in bio-archaeology*. Reading, Massachusetts: Addison-Wesley.

Clarke, A.
1987 Shieldaig and Redpoint. In C.K. Ballantyne and D.G. Sutherland (eds.) *Wester Ross: Field Guide*, 142-143. Cambridge: Quaternary Research Association.

1989 Corse Law, Carnwath, Lanarkshire: a lithic scatter. *PSAS* 119: 43-54.

1990 Coarse stone tools. In C.R. Wickham-Jones (ed.), 117-126. Edinburgh: Society of Antiquaries of Scotland, Monograph 7.

Clarke, A. and D. Griffiths
1990 The use of bloodstone as a raw material for flaked stone tools in the west of Scotland. In C.R. Wickham-Jones (ed.), 149-156. Edinburgh: Society of Antiquaries of Scotland.

Clarke, A. and C.R. Wickham-Jones
1988 The ghost of Morton revisited: comment on Myers. *Scottish Archaeological Review* 5: 35-37.

Clarke, D.L.
1968 *Analytical Archaeology*. London: Methuen.

Clarke, P.A.
2007 Flaked Lithic Assemblage. In W. S. Hanson (ed.) *Elginhaugh: A Flavian Fort and its Annexe*, 537-565. London: Society for the Promotion of Roman Studies

Cobb, H.L.
2005 Midden, Meaning, Person, Place: Interpreting the Mesolithic of Western Scotland. In H.L. Cobb, F. Coward, L. Grimshaw and S. Price (eds.), 69-78. Oxford: BAR.

Cobb, H.L., F. Coward, L. Grimshaw and S. Price (eds.)
2005 *Investigating Prehistoric Hunter-Gatherer Identities: Case Studies from Palaeolithic and Mesolithic Europe*. Oxford: BAR.

Cobb, H.L. and S. Price
2005 We're Not Waiting Any More - Or, Hunting for Meaning in the Mesolithic of North-West Europe. In H.L. Cobb, F. Coward, L. Grimshaw and S. Price (eds.), 65-67. Oxford: BAR.

Colebrook, C.
2006 *Deleuze: A Guide for the Perplexed*. London: Continuum.

2009 Introduction. In J.A. Bell and C. Colebrook (eds.), 1-32. Edinburgh:

Edinburgh University Press.

Coles, J.M.
1963 New Aspects of the Mesolithic Settlement of South-West Scotland. *TDGNHAS* 41: 67-98.

1971 The early settlement of Scotland: excavations at Morton, Fife. *Proceedings of the Prehistoric Society* 37(2): 284-366.

1983 Excavations at Kilmelfort Cave, Argyll. *PSAS* 113: 11-21.

1983a Morton revisited. In A. O'Connor and D.V. Clarke (eds.) *From the Stone Age to the 'Forty-Five*, 9-18. Edinburgh: John Donald.

Conkey, M.W.
1990 Experimenting with Style in Archaeology: Some Historical and Theoretical Issues. In M.W. Conkey and C. Hastorf (eds.), 5-17. Cambridge: Cambridge University Press.

2006 Style, Design, and Function. In C. Tilley, W. Keane, S. Küchler, M. Rowlands and P. Spyer (eds.), 355-372. London: Sage.

Conkey, M.W. and J.M. Gero
1997 Programme to Practice: Gender and Feminism in Archaeology. *Annual Review of Anthropology* 26: 411-437.

Conkey, M.W. and C. Hastorf (eds.)
1990 *The Uses of Style in Archaeology*. Cambridge: Cambridge University Press.

Conkey, M.W. and J.D. Spector
1984 Archaeology and the Study of Gender. *Advances in Archaeological Method and Theory* 27(1): 1-38.

Conneller, C.J.
2000 Editorial. *Archaeological Review from Cambridge* 17(1): 1-4.

2000a Fragmented space? Hunter-gatherer-landscapes of the Vale of Pickering. *Archaeological Review from Cambridge* 17(1): 139-150.

2003 Star Carr recontextualised. In L. Bevan and J. Moore (eds.), 81-86. Oxford: BAR.

2004 Hunter-gatherers 'on the move'? *Antiquity* 78: 916-922.

2004a Becoming deer: corporeal transformations at Star Carr. *Archaeological Dialogues* 11(1): 37-56.

2005 Moving Beyond Sites: Mesolithic Technology in the Landscape. In N. Milner and P.C. Woodman (eds.), 42-55. Oxford: Oxbow.

2008 Lithic Technology and the *Chaîne Opératoire*. In J. Pollard (ed.), 161-176. Oxford: Blackwell.

Conneller, C.J. and T. Schadla-Hall
2003 Beyond Star Carr: the Vale of Pickering in the 10th Millennium BP. *Proceedings of the Prehistoric Society* 69: 85-106.

Conneller, C.J. and G. Warren (eds.)
2006 *Mesolithic Britain and Ireland: New Approaches*. Stroud: Tempus.

Connock, K.D., B. Finlayson and C. Mills
1993 Excavation of a shell midden site at Carding Mill Bay, near Oban, Scotland. *GAJ* 17: 25-38.

Cook, G., C. Bonsall, C. Pickard, K. McSweeney, L. Bartosiewicz and A. Boroneant.
2009 The Mesolithic-Neolithic Transition in the Iron Gates, Southeast Europe: Calibration and Dietary Issues. In P. Crombé, M. van Strydonck, J. Sergant, M. Boudin and M. Bats (eds.), 497-515. Newcastle upon Tyne: Cambridge Scholars.

Cook, M.
2002 Ailsa View. *DES*: 108.

Coote, J. and A. Shelton (eds.)
1994 [1992] *Anthropology, Art and Aesthetics*. Oxford: Oxford University Press.

Cormack, W.F.
1970 A Mesolithic Site at Barsalloch, Wigtownshire. *TDGNHAS* 47: 63-80.

1986 Little Kilchattan. *DES*: 26.

Cormack, W.F. and J.M. Coles
1968 A Mesolithic Site at Low Clone, Wigtownshire. *TDGNHAS* 45: 44-72.

Costa, L-J. and F. Sternke
2009 One problem – many solutions: strategies of lithic raw material procurement in Mesolithic Europe. In McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman (eds.), 795-801. Oxford: Oxbow.

Costa, L-J., F. Sternke and P.C. Woodman
2005 Microlith to macrolith: the reasons behind the transformation of production in the Irish Mesolithic. *Antiquity* 79: 19-33.

Croes, D.R.
1989 Prehistoric Ethnicity on the northwest Coast of North America: An Evaluation of Style in Basketry and Lithics. *Journal of Anthropological Archaeology* 8: 101-130.

Croll, E. and D. Parkin (eds.)
1992 *Bush Base: Forest Farm, Culture, Environment and Development*. London: Routledge.

Crombé, P., Y. Perdaen, J. Sargent, J-P. Van Roeyan and M. Van Strydonck
2002 The Mesolithic-Neolithic transition in the sandy lowlands of Belgium: new evidence. *Antiquity* 76: 699-706.

Crombé, P., M. van Strydonck, J. Sergant, M. Boudin and M. Bats (eds.)
2009 *Chronology and Evolution within the Mesolithic of North-West Europe: Proceedings of an International Meeting, Brussels, May 30th-June 1st 2007.* Newcastle upon Tyne: Cambridge Scholars Publishing.

Cummings, V.
2000 Myth, Memory and Metaphor: The Significance of place, Space and the Landscape in Mesolithic Pembrokeshire. In R. Young (ed.), 87-95. Leicester: University of Leicester.

2003 The origins of monumentality? Mesolithic world-views of the landscape in western Britain. In L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.), 74-81. Oxford: Oxbow.

2007 From midden to megalith? The Mesolithic-Neolithic transition in western Britain. In A. Whittle and V. Cummings (eds.), 493-510. Oxford: British Academy.

2009 Southern Kintyre Project. Unpublished paper delivered at the University of Glasgow, Department of Archaeology Seminar Series.

2010 A view from the outside: some thoughts on the research priorities for Mesolithic and Neolithic studies in Britain and Ireland. *Lithics* 31: 68-77.

Cummings, V. And G. Robinson
2007 Interactions across the Irish Sea: The Southern Kintyre Project. *Past* 55: 12-13.

D'Alleva, A.
2001 Captivation, Representation, and the Limits of Cognition: Interpreting Metaphor and Metonym in Tahitian *Tamau*. In C. Pinney and N. Thomas (eds.), 79-96. Oxford: Berg.

Darvill, T.
1999 Billown Neolithic landscape project 1995-1997. In P.J. Davey (ed.), *Recent Archaeological Research on the Isle of Man*, 13-26. Oxford: BAR.

2003 Analytical scale, population and the Mesolithic-Neolithic transition in the far northwest of Europe. In L. Bevan and J. Moore (eds.), 95-102. Oxford: BAR.

David, A.
1998 Two assemblages of Later Mesolithic Microliths from Seamer Carr, North Yorkshire: Fact and Fancy. In N. Ashton, F. Healy and P. Pettitt (eds.), 196-204. Oxford: Oxbow.

Davidson, J.M., J. Phemister and A.D. Lacaille
1949 A Stone Age Site at Woodend Loch, near Coatbridge. *PSAS* 83: 77-98.

Deetz, J.F.
1977 *In Small Things Forgotten: The Archaeology of Early American Life.*

Garden City: Anchor.

Deith, M.R.
1983 Molluscan calendars: the use of growth-line analysis to establish seasonality of shellfish collection at the Mesolithic site of Morton, Fife. *Journal of Archaeological Science* 10: 423-440.

Deleuze, G.
1988 [1966] *Bergsonism*. New York: Zone.

2004 [1968] *Difference and Repetition*. London: Continuum.

1990 [1969] *The Logic of Sense*. New York: Columbia University Press.

1986 [1983] *Cinema 1: the movement-image* London: Athlone Press.

1999 [1986] *Foucault*. London: Continuum.

1995 [1990] *Negotiations 1972-1990*. New York: Columbia University Press.

Deleuze, G. and F. Guattari
2004 [1972] *Anti-Oedipus: Capitalism and Schizophrenia*. London: Continuum.

1987 [1980] *A Thousand Plateaus: Capitalism and Schizophrenia*. London: University of Minnesota Press.

1994 *What is Philosophy?* London: Verso.

Derrida, J.
2001 *The Work of Mourning*. Chicago: Chicago University Press.

2003 Autoimmunity: Real and Symbolic Suicides. In G. Borradori (ed.) *Philosophy in a Time of Terror*, 85-136. Chicago and London: Chicago University Press.

Dickson, J.H.
1981 A Pollen Diagram from the Auld Wives' Lifts, Craigmaddie Muir, Strathclyde. *GAJ* 8: 13-18.

Dickson, J.H., D.A. Stewart, R. Thompson, G. Turner, M.S. Baxter, N.D. Drndarski and J. Rose
1978 Palynology, palaeomagnetism and radiometric dating of Flandrian marine and freshwater sediments of Loch Lomond. *Nature* 274: 548-553.

Dietler, M. and I. Herbich
1998 *Habitus*, Techniques, Style: An Integrated Approach to the Social Understanding of Material Culture and Boundaries. In M.T. Stark (ed.), 232-263. London: Smithsonian Institution Press.

Dobres, M-A.
2000 *Technology and Social Agency*. Oxford: Blackwell.

2001 Meaning in the Making: Agency and the Social Embodiment of Technology and Art. In M.B. Schiffer (ed.), 47-76. Albuquerque: University of New Mexico Press.

2010 Archaeologies of Technology. *Cambridge Journal of Economics* 34: 103-114.

Dobres, M-A. and C.R. Hoffman
1994 Social Agency and the Dynamics of Prehistoric Technology. *Journal of Archaeological Method and Theory* 1(3): 211-258.

Dobres, M-A. and J. Robb (eds.)
2000 *Agency in Archaeology*. London: Routledge.

2000a Agency in Archaeology: Paradigm or Platitude? In M-A. Dobres and J. Robb (eds.), 3-17. London: Routledge.

Dolukhanov, P.
2008 The Mesolithic of European Russia, Belarus, and the Ukraine. In G. Bailey and P. Spikins (eds.), 280-301. Cambridge: Cambridge University Press.

Donnelly, M.
1998 Gallow Hill, Girvan. *DES*: 86.

Donnelly, M. and N. Finlay
nd. Arran Ring Main Water Pipeline 1999: Lithic assemblages. Unpublished Manuscript.

Donnelly, M. and G. MacGregor
2005 The excavation of Mesolithic activity, Neolithic and Bronze Age Burnt Mounds and Romano-British Ring Groove Houses at Gallow Hill, Girvan. *Scottish Archaeological Journal* 27.1: 31-69.

Douglas, D. (ed.)
1878 *Archaeological and Historical Collections relating to the Counties of Ayr and Wigton Volume I*. Edinburgh: Ayr and Wigton Archaeological Association.

1882 *Archaeological and Historical Collections relating to the Counties of Ayr and Wigton Volume III*. Edinburgh: Ayr and Wigton Archaeological Association.

1885 *Archaeological and Historical Collections of Ayrshire and Galloway Volume V*. Edinburgh: Ayr and Galloway Archaeological Association.

Duncan, J.S.
1997 Hare Hill/Climpy. *DES*: 75.

1999 Climpy, Forth, South Lanarkshire. Unpublished report. GUARD 439.5.

Edgar, W.
1939 A Tardenoisian Site at Ballantrae, Ayrshire. *Transactions of the Glasgow Archaeological Society* 9(3): 184-188.

Edmonds, M.
1997 Taskscape, technology and tradition. *Analecta Praehistorica Leidensia* 29: 99-110.

Edwards, K.J.
1989 Meso-Neolithic Vegetational Impacts in Scotland and Beyond: Palynological Considerations. In C. Bonsall (ed.), 143-155. Edinburgh: John Donald Publishers Ltd.

1990 Fire and the Scottish Mesolithic: Evidence from Microscopic Charcoal. In M. Vermeersch and P. Van Peer (eds.), 71-79. Leuven: Leuven University Press.

1996 The Contribution of Tom Affleck to the Study of the Mesolithic of Southwest Scotland In T. Pollard and A. Morrison (eds.), 108-122. Edinburgh: Edinburgh University Press.

Edwards, K.J., M. Ansell and B. A. Carter
1983 New Mesolithic sites in south west Scotland and their importance as indicators of inland penetration. *TDGNHAS* 58: 9-15.

Edwards, K.J., C.J. McIntosh and R.E. Robinson
1986 Optimising the detection of cereal-type pollen grains in pre-elm decline deposits. *Circaea* 4.1: 11-13.

Edwards, K.J. and S.J. Mithen
1995 The colonization of the Hebridean Islands of Western Scotland: Evidence from the palynological and archaeological records. *World Archaeology* 26(3): 348-365.

Edwards, K.J. and I.B.M. Ralston (eds.)
2003 [1997] *Scotland After the Ice Age: Environment, Archaeology and History, 8000BC-AD1000*. Edinburgh: Edinburgh University Press.

Edwards, K.J. and I.B.M. Ralston
1984 Postglacial hunter-gatherers and vegetational history in Scotland. *PSAS* 114: 15-34.

Edwards, K.J. and G. Whittington
2003 [1997] Vegetation Change. In K.J. Edwards and I.B.M. Ralston (eds.), 63-82. Edinburgh: Edinburgh University Press.

Eigeland, L.
2008 Technology of the Heart - The Chaîne Opératoire concept and six lithic assemblages from the South-Eastern Norwegian Late Mesolithic. In M. Sørenson and P. Desrosiers (eds.), 149-171. Copenhagen: PNM.

2009 Flint knappers or quartz knappers? The procurement of different types of quartz in south-east Mesolithic Norway. In McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman (eds.), 833-835. Oxford: Oxbow.

Endicott, K.
1988 Property, power and conflict among the Batek of Malaysia. In T. Ingold, D.

Riches and J. Woodburn (eds.) 1988a, 110-127. Oxford: Berg.

Engen, M. and P. Spikins
2007 'A Needle in a Haystack?': Perspectives on Prospection for Submerged Mesolithic Sites. In C. Waddington and K. Pedersen (eds.), 25-32. Oxford: Oxbow.

Estévez, J. and A. Vila
2006 Variability in the lithic and faunal record through 10 occupations of a XIX century *Yamana* Hut. *Journal of Anthropological Archaeology 25*: 408-423.

Fairhurst, H.
1988 [1981] *Exploring Arran's Past*. Brodick: Kilbrannan Publishing Limited.

Falkenström, P.
2009 Percussion events by the shore: a comparative approach to the manufacture and use of quartz in Uppland, Sweden. In McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman (eds.), 827-832. Oxford: Oxbow.

Feit, H.A.
1995 Hunting and the quest for power. The James Bay Cree and Whitemen in the 20th Century. (http://arcticcircle.uconn.edu/HistoryCulture/Cree/Feit1/feit1.html) Last viewed: 7th May 2009.

Finlay, N.
1997 Exploring the social dimensions of microlithic technology: experimental and analytical approaches with a case study from western Scotland. University of Reading: Unpublished PhD Thesis.

1997a Kid-knapping: the missing children in lithic analysis. In J. Moore and E. Scott (eds.), 203-212. Leicester: Leicester University Press.

1997b Flint. In J.W. Barber (ed.), 27-29. Edinburgh: Scottish Trust for Archaeological Research (Monograph 2).

1997c Flint and pitchstone from the soil test pits. In J.W. Barber (ed.), 65-67. Edinburgh: Scottish Trust for Archaeological Research (Monograph 2).

1997d Flint and pitchstone from 24/01. In J.W. Barber (ed.), 94-95. Edinburgh: Scottish Trust for Archaeological Research (Monograph 2).

1997e Lithics from the Arran Sites: Summary and Discussion. In J.W. Barber (ed.), 131-136. Edinburgh: Scottish Trust for Archaeological Research (Monograph 2).

1997f Assessment of the Cnoc Coig Lithic Assemblage: 1975 Sample Pits. Unpublished preliminary report.

2000 Deer Prudence. *Archaeological Review Cambridge* 17(1): 67-79.

2000a Microliths in the Making. In R. Young (ed.), 23-31. Leicester: University of

Leicester.

2003 Ballianlay, Kerrylamont and The Plan. *DES*: 36.

2003a Cache and carry: defining moments in the Irish later Mesolithic. In L. Bevan and J. Moore (eds.), 87-94. Oxford: BAR.

2003b Microliths and multiple authorship. In L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.), 169-178. Oxford: Oxbow.

2006 Gender and personhood. In C.J. Conneller and G. Warren (eds.), 35-60. Stroud: Tempus.

2006a Manifesting microliths: insights and strategies from experimental replication. In J. Apel and K. Knutsson (eds.), 299-314. Uppsala: SAU.

2006b Port Lobh 1, Colonsay: 2006 excavations: Data Structure Report. Unpublished report: University of Glasgow.

2008 Blank Concerns: Issues of Skill and Consistency in the Replication of Scottish Later Mesolithic Blades. *Journal of Archaeological Theory and Method* 15(1): 68-90.

2009 Futile Fragments? - some thoughts on microlith breakage patterns. In N. Finlay, S. McCartan, N. Milner and C.R. Wickham-Jones (eds.), 22-30. Oxford: Oxbow.

Forthcoming The Mesolithic: Glasgow Regional Framework. ScARF: Unpublished manuscript.

Forthcoming a William Grant & Sons Distillery, Girvan, South Ayrshire: Lithic Assemblage Report. GUARD.

Finlay, N., B. Finlayson and S.J. Mithen
2000 The Primary Technology: its Character and Inter-site Variability. In S.J. Mithen (ed.), 553-569. Cambridge: McDonald Institute for Archaeological Research.

2000a The Secondary Technology: its Character and Inter-site Variability. In S.J. Mithen (ed.), 571-587. Cambridge: McDonald Institute for Archaeological Research.

Finlay, N., S. McCartan, N. Milner and C.R. Wickham-Jones (eds.)
2009 *From Bann Flakes to Bushmills: papers in honour of Professor Peter Woodman*. Oxford: Oxbow.

Finlay, N., G. Warren and C.R. Wickham-Jones
2003 The Mesolithic in Scotland: East meets West. *Scottish Archaeological Journal* 24(2): 101-120.

Finlayson, B.
1989 A Pragmatic Approach to the Functional Analysis of Chipped Stone Tools. University of Edinburgh: Unpublished PhD Thesis.

1990 Lithic exploitation during the Mesolithic in Scotland. *Scottish Archaeological Review* 7: 41-57.

1990a The function of microliths: evidence from Smittons and Starr, SW Scotland. *Mesolithic Miscellany* 11(1): 2-6.

1995 Complexity in the Mesolithic of the Western Scottish seaboard. In A. Fischer (ed.), 261-264. Oxford: Oxbow.

1999 Understanding the initial colonization of Scotland. *Antiquity* 73(4): 879-884.

2004 The Use of Stone Tools in Mesolithic Scotland: Function, Value, Decision-Making, and Landscapes. In A. Saville (ed.), 221-228. Edinburgh: Society of Antiquaries of Scotland.

2006 Overview - setting up questions. In C. J. Conneller and G. Warren (eds.), 165-184. Stroud: Tempus.

Finlayson, B. and K.J. Edwards
2003 [1997] The Mesolithic. In K.J. Edwards and I.B.M. Ralston (eds.), 109-125. Edinburgh: Edinburgh University Press.

Finlayson, B., N. Finlay and S.J. Mithen
1996 Mesolithic Chipped Stone Assemblages: Descriptive and Analytical Procedures used by the Southern Hebrides Mesolithic Project. In T. Pollard and A. Morrison (eds.), 252-266. Edinburgh: Edinburgh University Press.

2000 The cataloguing and analysis of the lithic assemblages. In S.J. Mithen (ed.), 61-72. Cambridge: MacDonald Institute for Archaeological Research.

Fischer, A. (ed.)
1995 *Man and Sea in the Mesolithic: Coastal Settlement above and below present sea level*. Oxford: Oxbow.

Fletcher, M. and G.R. Lock
2005 *Digging Numbers: Elementary Statistics for Archaeologists*. Oxford: Oxford university Committee for Archaeology.

Foley, R.
1981 Off-site archaeology: an alternative approach for the short sited. In I. Hodder, G. Isaac, N. Hammond (eds.), *Pattern of the Past: Studies in Honour of David Clarke*, 157-182. Cambridge: Cambridge University Press.

Foucault, M.
2004 [1963] *Death and the labyrinth: the world of Raymond Rousell*. London: Continuum.

1970 Theatrum Philosophicum. *Critique* 282: 885-908.

1998 [1976] *The Will to Knowledge: The History of Sexuality Volume 1*. London: Penguin.

Fowler, C.
2004 The Archaeology of Personhood: an anthropological approach. London and New York: Routledge.

Gadamer, H-G.
1976 *Philosophical Hermeneutics*. London and Berkeley: University of California Press.

Gaffney, V., K. Thomson and S. Fitch (eds.)
2007 *Mapping Doggerland: the Mesolithic landscapes of the southern North Sea*. Oxford: Archaeopress.

Gamble, C.
2007 *Origins and Revolutions: Human Identity in Earliest Prehistory*. Cambridge: Cambridge University Press.

Gardiner, J.
1987 Tales of the Unexpected: Approaches to the Assessment and Interpretation of Museum Flint Collections. In A. G. Brown and M. R. Edmonds (eds.), *Lithic Analysis and Later British Prehistory*, 49-65. Oxford: BAR.

Gardiner, P.
2003 Caught in the act - Where is this transition? In L. Bevan and J. Moore (eds.), 103-112. Oxford: BAR.

Gatewood, J.
1985 Actions speak louder than words. In J. Dougherty (ed.) *Directions in cognitive anthropology*, 251-270. Urbana: University of Illinois Press.

Geertz, C.
2005 [1972] Deep play: notes on the Balinese cockfight. *Dædalus* 134(4): 56-86.

Gell, A.
1994 [1992] The technology of enchantment and the enchantment of technology. In J. Coote and A. Shelton (eds.), 40-63. Oxford: Oxford University Press.

1998 *Art and Agency: An Anthropological Theory*. Oxford: Clarendon Press.

Gendel, P.A.
1984 *Mesolithic Social Territories in Northwestern Europe*. Oxford: BAR.

1987 Socio-stylistic Analysis of Lithic Artefacts from the Mesolithic of Northwestern Europe. In P.A. Rowley-Conwy, M. Zvelebil and H.P. Blankholm (eds.), 65-73. Sheffield: University of Sheffield.

1989 The Analysis of Lithic Styles through distributional profiles of variation from the Western European Mesolithic. In C. Bonsall (ed.), 40-47. Edinburgh: John Donald Publishers Ltd.

Gero, J.M.
1983 Gender Bias in Archaeology: A Cross-Cultural Perspective. In J.M. Gero, D. Lacey and M. Blakey (eds.) *The Socio-Politics of Archaeology*, 51-57. Amherst: University of Massachusetts.

1991 Genderlithics: Women's Roles in Stone Tool Production. In J.M. Gero and M. W. Conkey (eds.), *Engendering Archaeology*, 163-193. Oxford: Blackwell.

Gibson, K.R. and T. Ingold (eds.)
1993 *Tools, Language and Cognition in Human Evolution*. Cambridge: Cambridge University Press.

Giddens, A.
1984 *The Constitution of Society: Outline of a Theory of Structuration*. Cambridge: Polity Press.

Gilchrist, R.
1999 *Gender and Archaeology: Contesting the Past*. London: Routledge.

Gillen, C.
2003 *Geology and Landscapes of Scotland*. Harpenden: Terra Publishing.

Glassie, H.
1975 *Folk Housing in Middle Virginia: A Structural Analysis of Historic Artefacts*. Knoxville: University of Tennessee Press.

Goodby, R. G.
1998 Technological Patterning and Social Boundaries: Ceramic Variability in Southern New England, AD 1000-1675. In M.T. Stark (ed.), 161-182. London: Smithsonian Institution Press.

Gooder, J.
2002 Ailsa View. *DES*: 108-109.

2003 East Barns. *DES*: 159.

2007 Excavation of a Mesolithic House at East Barns, East Lothian, Scotland: An Interim View. In C. Waddington and K. Pedersen (eds.), 49-59. Oxford: Oxbow Books.

Gorman, F., E. Lambie and C. Bowd
1993 Machrie, Arran. *DES*: 79.

Gorman, F., B. Murray and E. Lambie
1995 Kildonan, Arran; Machrie, Arran. *DES*: 72.

Gosden, C.
1994 Social Being and Time. Oxford: Blackwell.

1999 *Anthropology and Archaeology: A Changing Relationship*. London: Routledge.

Gosden, C. and Y. Marshall (eds.)
1999 *The Cultural Biography of Objects*. Taylor and Francis Ltd.

Gosden, C. and Y. Marshall
1999a The Cultural Biography of Objects. In C. Gosden and Y. Marshall (eds.), 169-178: Taylor and Francis Ltd.

Gould, A.
2009 Turnberry: Analysis and Comparative Investigation of a Mixed Period Lithic Assemblage. University of Glasgow: Unpublished Undergraduate Dissertation.

Gramsch, B.
1987 Ausgrabungen auf dem mesolithischen Fundplatz bei Friesack, Bezik Potsdam. *VP* 21: 75-100.

Gray, A.
1894 Notice of the discovery of a cinerary urn of the Bronze Age, and of worked flint underneath it at Dalaruan; also of an old flint working-place in the 30-foot raised beach at Millknowe, Cambeltown. *PSAS* 28: 263-274.

Gray, A.F.
1956 Notes on some of the antiquities and other landmarks in the parish of Ballantrae, Ayrshire. Unpublished manuscript.

Green, H.S.
1980 *The flint arrowheads of the British Isles: a detailed study of material from England and Wales with comparanda from Scotland and Ireland.* Oxford: BAR.

Gregory, R.A.
2000 Prehistoric Landscapes in Dumfries and Galloway: Part 1. Mesolithic and Neolithic Landscapes. *TDGNHAS* 74: 1-26.

Greig, D.C.
1971 *British Regional Geology: The South of Scotland*. Edinburgh: HMSO.

Grøn. O.
2003 Mesolithic dwelling places in south Scandinavia: their definition and social interpretation. *Antiquity* 77(4): 685-707.

Hall, A.M.
1991 Pre-Quaternary landscape evolution in the Scottish Highlands. *Transactions of the Royal Society of Edinburgh* 82: 1-26.

Hardy, K. and R. Piqué
2009 Hunters and gatherers on the edge: foraging for the past at the continental limits. *Antiquity* 83: Project Gallery.

Hardy, K., A. Saville, R. Miket and T.B. Ballin
Forthcoming An Corran, Staffin, Skye: A Rockshelter with Mesolithic and Later Occupation. *SAIR*.

Hardy, K. and C.R. Wickham-Jones (eds.)
2007 Mesolithic and later sites around the Inner Sound, Scotland: the work of the Scotland's First Settlers Project 1998-2004. *SAIR* 31 (http://www.sair.org.uk/sair31/). Last viewed 4th July 2011.

Hardy, K. and C.R. Wickham-Jones
2002 Scotland's first settlers: the Mesolithic seascape of the Inner Sound, Skye and its contribution to the early prehistory of Scotland. *Antiquity* 76: 825-833.

2003 Scotland's First Settlers: an investigation into settlement, territoriality and mobility during the Mesolithic in the Inner Sound, Scotland, first results. In L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.), 369-381. Oxford: Oxbow.

2007a Introduction. In K. Hardy and C.R. Wickham-Jones (eds). (http://www.sair.org.uk/sair31/).

Hasson, S.
1996 Frontier and Periphery as Symbolic Landscapes. *Cultural Geographies* 3: 146-166.

Hawkes, C.F.C.
1954 Archaeological theory and method: Some suggestions from the Old World. *American Anthropologist* 56: 155-168.

Hayden, B.
1990 Nimrods, piscators, pluckers and planters: the emergence of food production. *Journal of Anthropological Archaeology* 9: 31-69.

1991 Confusion in the Bipolar World: Bashed Pebbles and Splintered Pieces, *Lithic Technology*, 10, 2-6.

Hedges, R.
2008 Approximate Correspondence between Uncalibrated Radiocarbon Dates and Calendar Years BC in the Time Range from 2,500 to 13,000 Radiocarbon Years BP. In G. Bailey and P. Spikins (eds.), 373-374. Cambridge: Cambridge University Press.

Hegmon, M.
1998 Technology, Style, and Social Practices: Archaeological Approaches. In M.T. Stark (ed.), 264-279. London: Smithsonian Institution Press.

Heidegger, M.
1962 [1927] *Being and Time*. London: SCM Press.

1977 [1949] *The Question Concerning Technology and Other Essays*. New York: Garland.

Heisenberg, W.
1930 *The Physical Principles of the Quantum Theory*. Chicago: Chicago University Press.

1958 *Physics and Philosophy: The Revolution in Modern Science*. New York: Harper and Rowe.

Henare, A., M. Holbraad and S. Wastell (eds.)
2007 *Thinking Through Things: Theorising Artefacts Ethnographically*. London: Routledge.

Henare, A., M. Holbraad and S. Wastell
2007a Thinking Through Things. In A. Henare, M. Holbraad and S. Wastell (eds.), 1-31. London: Routledge.

Herdt, G.H.
1987 *The Sambia: Ritual and Gender in New Guinea*. London: Harcourt College Publishers.

Hernek, R.
2003 A Mesolithic Winter-Site with a Sunken Dwelling from the Swedish West Coast. In L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.), 222-229. Oxford: Oxbow.

Hewlett, B.
1992 *Intimate Fathers: The Nature and Context of Aka Pygmy Paternal Infant Care*. Ann Arbor: University of Michigan Press.

Historic Scotland
nd. *Towards a Strategy for Scotland's Marine Historic Environment*. Edinburgh: Historic Scotland.

Hodder, I. (ed.)
1989 *The Meanings of Things: Material culture and symbolic expression*. London: Unwin Hyman.

2001 *Archaeological Theory Today*. Cambridge: Polity Press.

Hodder, I.
1982 *Symbols in Action: Ethnoarchaeological Studies of Material Culture*. Cambridge: Cambridge University Press.

1982a *Symbolic and Structural Archaeology*. Cambridge: Cambridge University Press.

1987 *Archaeology as Long-Term History*. Cambridge: Cambridge University Press.

1991 Interpretive archaeology and its role. *American Antiquity* 56: 7-18.

1991a Postprocessual archaeology and the current debate. In R.W. Preucel (ed.), 30-41. Carbondale: Southwestern Illinois University Occasional Paper 10.

2001a Introduction: A Review of Contemporary Theoretical Debates in Archaeology. In I. Hodder (ed.), 1-13. Cambridge: Polity Press.

2004 Neo-thingness. In J. Cherry, C. Scarre and S. Shennan (eds.), 45-52. Cambridge: McDonald Institute for Archaeological Research.

2011 Human-thing entanglement: towards an integrated archaeological perspective. Journal of the Royal Anthropological Institute 17(1): 154-177.

Hodder, I. and S. Hutson
2003 [1986] *Reading the Past*. Cambridge: Cambridge University Press.

Hodder, I., M. Shanks, A. Alexandri, V. Buchli, J. Carman, J. Last and G. Lucas (eds.)
1995 *Interpreting Archaeology: finding meaning in the past*. London: Routledge.

Holdaway, S. and L. Wandsnider (eds.)
2008 *Time in Archaeology: Time Perspectivism Revisited*. Salt Lake City: University of Utah Press.

Holdaway, S. and L. Wandsnider
2008a Time in Archaeology: An Introduction. In S. Holdaway and L. Wandsnider (eds.), 1-12. Salt Lake City: University of Utah.

Holdgate, M.W.
1961 Man and Environment in the South Chilean Islands. *The Geographic Journal* 127(4): 401-414.

Holm, J. and F. Rieck (eds.)
1992 *Istidsjægere ved Jelssøerne*. Haderslev: Skrifter fra Museumsrådet for Sønderjyllands Amt 5.

Holtorf, C.
1998 The Life-Histories of Megaliths in Mecklenburg-Vorpommern (Germany) *World Archaeology* 30(1): 23-38.

Horkheimer, M.
1972 *Critical Theory: Selected Essays*. New York: Herder and Herder.

Hoskins, J.
1988 *Biographical Objects: How Things Tell the Stories of People's Lives*. London: Routledge.

Hughes, I.
1988 Megaliths: space, time and the landscape - a view from the Clyde. *Scottish Archaeological Review* 5: 41-56.

1991 Solway and Clyde: Some Comments. *Scottish Archaeological Review* 8: 33-34.

Hume, J.R.
1996 John Smith - The Man and His Times: A Buchan Lecture of the Society of Antiquaries of Scotland. In D. Reid (ed.), *John Smith of Dalry: Geologist, Antiquarian and Natural Historian. Part 2: Archaeology and Natural*

History, 5-10. Darvel: Ayrshire Archaeological and Natural History Society (Ayrshire Monographs No.17).

Ichikawa, M.
1996 The co-existence of man and nature in the central African rain forest. In R.F. Ellen and K. Fukui (eds.) *Redefining nature*, 467-492. Oxford and Washington: Berg.

1999 The Mbuti of northern Congo. In R.B .Lee and R. Daly (eds.), 210-214. Cambridge: Cambridge University Press.

Ingold, T.
1988 Comment to Testart. *Current Anthropology* 29(1): 14-15.

1993 The Temporality of the Landscape. *World Archaeology* 25(2): 152-174.

1993a Tools, Technique and Technology: an introduction. In K. R. Gibson and T. Ingold (eds.), 337-345. Cambridge: Cambridge University Press.

1993b Tool Use, Sociality and Intelligence: A reconsideration of basic concepts. In K. R. Gibson and T. Ingold (eds.), 427-445. Cambridge: Cambridge University Press.

1995 "People Like Us": The Concept of the Anatomically Modern Human. *Cultural Dynamics* 7(2): 187-214.

1999 On the social relations of the hunter-gatherer band. In R.B. Lee and R. Daly (eds.), 399-410. Cambridge: Cambridge University Press.

2000 *The Perception of the Environment: Essays in livelihood, dwelling and skill*. London: Routledge.

2000 [1988] Tools, minds and machines: An excursion in the philosophy of technology. In T. Ingold 2000, 294-311. London: Routledge.

2001 Beyond Art and Technology: The Anthropology of Skill. In M.B. Schiffer (ed.), 17-31. Albuquerque: University of New Mexico Press.

Ingold, T., D. Riches and J. Woodburn (eds.)
1988 *Hunters and Gatherers: History, Evolution and Change*. Oxford: Berg.

1988a *Hunters and Gatherers: Property, Power and Ideology*. Oxford: Berg.

Inizan, M-L., M. Reduron-Ballinger, H. Roche and J. Tixier
1999 *Technology and Terminology of Knapped Stone*. Nanterre: CREP.

Innes, J.B. and J.J. Blackford
2003 The ecology of Late-Mesolithic woodland disturbances; model testing with fungal spore assemblages. *Journal of Archaeological Science* 30: 185-194.

Innes, J.B., J.J. Blackford and P.J. Davey
2003 Dating the introduction of cereal cultivation to the British Isles: early palaeological evidence from the Isle of Man. *Journal of Quaternary*

Science 18(7): 603-613.

Innes, J.B., J.J. Blackford and P.A. Rowley-Conwy
2003 The start of the Mesolithic-Neolithic transition in North-West Europe - the palynological contribution. *Antiquity* 77 (Antiquity.ac.uk/Proj-Gall/blackford/blackford.html) Last viewed 26th March 2009.

Innes, L.H. and J.S. Duncan
nd Excavation at an enclosure and flint scatters at Climpy, South Lanarkshire. Unpublished report: GUARD.

Innes, L., A.D. Wright and J. Duncan
Forthcoming Rescue excavation of an enclosure and lithic material at Climpy, Forth, South Lanarkshire.

Jacobi, R.M.
1973 Aspects of the 'Mesolithic Age' in Great Britain. In S.K. Kozlowski (ed.), *The Mesolithic in Europe*, 237-265. Warsaw: Warsaw University Press.

1976 Britain inside and outside Mesolithic Europe. *Proceedings of the Prehistoric Society* 42: 67-84.

1978 Northern England in the eighth millennium bc: an essay. In P.A. Mellars (ed.), *The Early Postglacial Settlement of Northern Europe*, 295-332. London: Duckworth.

1987 Misanthropic miscellany: Musings on British early Flandrian archaeology and other flights of fancy. In P. Rowley-Conwy, M. Zvelebil and H.P. Blankholm (eds.), 163-168. Sheffield: University of Sheffield.

Janik, L.
2000 The construction of the individual among Northern European fisher-gatherer-hunters in the Early and Mid-Holocene. In J.R. Sofaer (ed.), 118-130. London: Routledge.

2005 Redefining Social Relations - Tradition, Complementarity and Internal Tension. In N. Milner and P.C. Woodman (eds.), 176-193. Oxford: Oxbow.

Jardine, W.G.
1962 Post-glacial sediments at Girvan, Ayrshire. *Transactions of the Geological Society of Glasgow* 24: 262-278.

1971 Form and age of late Quaternary shorelines and coastal deposits of South-West Scotland: critical data. *Quaternaria* 14: 103-114.

1975 Chronology of marine transgression and regression in south-western Scotland. *Boreas* 4(4): 173-196.

Jardine, W.G. and A. Morrison
1976 The archaeological significance of Holocene coastal deposits in south-western Scotland. In D.A. Davidson and M.L. Shackley (eds.), *Geoarchaeology: Earth Science and the Past*, 175-195. London: Duckworth.

Jensen, C.B. and K. Rödje (eds.)
2010 *Deleuzian Intersections: Science, Technology, Anthropology*. New York: Berghahn Books.

2010a Introduction. In C.B. Jensen and K. Rödje (eds.), 1-35. New York: Berghahn.

Jensen, O.L.
2003 A Sunken Dwelling from the Ertebölle Site Nivå 10, Eastern Denmark. In L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.), 230-238. Oxford: Oxbow.

Jochim, M.A.
1991 Archaeology as long-term ethnography. *American Anthropologist* 93: 309-319.

1998 *A hunter-gatherer landscape: southwest Germany in the late Palaeolithic and Mesolithic*. London: Plenum Press.

2008 The Mesolithic of the Upper Danube and Upper Rhine. In G. Bailey and P. Spikins (eds.), 203-220. Cambridge: Cambridge University Press.

Johnson, J.K.
1996 Lithic analysis and questions of cultural complexity: the Maya. In G. H. Odell (ed.), *Stone Tools: Theoretical Insights into Human Prehistory*, 159-180. London: Plenum Press.

Johnston, D.A.
1997 Biggar Common, 1987-93: an early prehistoric funerary and domestic landscape in Clydesdale, South Lanarkshire. *PSAS* 127: 185-253.

Jones, A.
2008 How the Dead Live: Mortuary Practices, Memory and the Ancestors in Neolithic and Early Bronze Age Britain and Ireland. In J. Pollard (ed.), 177-201. Oxford: Blackwell.

Jones, V.J., A.C. Stevenson and R.W. Batterbee
1989 Acidification of lakes in Galloway, south-west Scotland: a diatom and pollen study of the post-glacial history of the Round Loch of Glenhead. *Journal of Ecology* 77: 1-23.

Jordan, P.
2003 Peopling the Mesolithic: insights from ethnographies of landscape and material culture. In L. Bevan and J. Moore (eds.), 27-34. Oxford: BAR.

2006 Analogy. In C.J. Conneller and G. Warren (eds.), 83-100. Stroud: Tempus.

Joyce, R.A.
2004 Embodied Subjectivity: Gender, Femininity, Masculinity, Sexuality. In L. Meskell and R.W. Preucel (eds.), 82-95. Oxford: Blackwell.

Kamminga, J.
1982 *Over the Edge: Functional analysis of Australian stone tools*. Occasional Papers on Anthropology 12: University of Queensland.

Karlin, C. and M. Julien
1994 Prehistoric technology: a cognitive science? In C. Renfrew and E.B.W. Zubrow (eds.), 152-164. Cambridge: Cambridge University Press.

Keller, C.M.
2001 Thought and Production: Insights of the Practitioner. In M.B. Schiffer (ed.), 33-45. Albuquerque: University of New Mexico Press.

Kelly, R.L.
1995 *The Foraging Spectrum: Diversity in Hunter-Gatherer Lifeways*. Washington D.C.: Smithsonian Institution Press.

Kenworthy, J.B.
1982 The Flint. In J. C. Murray (ed.) *Excavations in the Medieval Burgh of Aberdeen*, 205-215. Edinburgh: Society of Antiquaries of Scotland.

Kim, J.
1990 Supervenience as a philosophical concept. *Metaphilosophy* 21: 1-27.

Knapp, A.B.
1992 Archaeology and Annales: Time, Space and Change. In A.B. Knapp (ed.) *Archaeology, Annales and Ethnohistory*, 1-21. Cambridge: Cambridge University Press.

1996 Archaeology Without Gravity: Postmodernism and the Past. *Journal of Archaeological Method and Theory* 3(2): 127-158.

Knapp, A.B. and P. van Dommelen
2008 Past Practices: Rethinking Individuals and Agents in Archaeology. *Cambridge Archaeological Journal* 18(1): 15-34.

Knappett, C.
2002 Photographs, Skeuomorphs and Marionettes: Some Thoughts on Mind, Agency and Object. *Journal of Material Culture* 7(1): 97-117.

Knight, J.
1991 Technological Analysis of the Anvil (Bipolar) Technique, *Lithics*, 12, 57-87.

Kopytoff, I.
1986 The cultural biography of things: commoditization as process. In A. Appadurai (ed.), 64-91. Cambridge: Cambridge University Press.

Kozlowski, S.K.
1977 Project d'une cartographie des éléments typologiques mésolithiques en Europe. In M. Escalon de Fonton (ed.). *Congrès Préhistorique de France. XX e Session, Provence*. Paris: Socièté Préhistorique Française.

2009 *Thinking Mesolithic*. Oxford: Oxbow.

Kratz, C.A.
1988 The unending ceremony and a warm house: representation of patriarchal ideal and the silent complementarity in Obiek blessing. In T. Ingold, D. Riches and J. Woodburn (eds.) 1988a, 215-248. Oxford: Berg.

Kuijt, I., W.C. Prentiss and D.L. Pokotylo
1995 Bipolar Reduction: An Experimental Study of Debitage Variability, *Lithic Technology*, 20 (2), 116-127.

Lacaille, A.D.
1930 Mesolithic implements from Ayrshire. *PSAS* 64: 34-48.

1935 The Tardenoisian micro-burin in Scotland. *PSAS* 69: 443-445.

1937 The Microlithic Industries of Scotland. *Transactions of the Glasgow Archaeological Society* 9: 56-74.

1939 A barbed point of deer antler from Shewalton, Ayrshire. *PSAS* 73: 48-50.

1940 Some Scottish core-tools and ground-flaked implements of stone. *PSAS* 74: 6-13.

1945 The stone industries associated with the raised beach at Ballantrae. *PSAS* 79: 81-106.

1946 The northward march of Palaeolithic man in Britain. *Proceedings of the Geological Association* 57(2): 57-81.

1948 The Stone Age Background of Scotland. *TDGNHAS* 26: 9-40.

1954 *The Stone Age in Scotland*. London: Oxford University Press.

Lampert, J.
2009 Theory of Delay in Balibar, Freud and Deleuze: Décalage, Nachträglichkeit, Retard. In J.A. Bell and C. Colebrook (eds.), 72-91. Edinburgh: Edinburgh University Press.

Larsson, L.
2004 The Mesolithic Period in Southern Scandinavia: with Special Reference to Burials and Cemeteries. In A. Saville (ed.), 371-392. Edinburgh: Society of Antiquaries of Scotland.

2007 Mesolithic Episodes. Three Mesolithic Sites in Eastern Middle Sweden. In C. Waddington and K. Pedersen (eds.), 40-48. Oxford: Oxbow.

Larsson, L., H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.)
2003 *Mesolithic on the Move*. Oxford: Oxbow.

Latour, B.
2005 *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.

Lawson, J.
2001 Cramond, Edinburgh [radiocarbon dates]. *DES*: 124.

Layton, R.
2003 Art and Agency: A Reassessment. *Journal of the Royal Anthropological Institute* 9: 447-464.

Layton, R. and S. O'Hara
2010 Human Social Evolution: A Comparison of Hunter-gatherer and Chimpanzee Social Organization. In R. Dunbar, C. Gamble and J. Gowlett (eds.), *Social Brain, Distributed Mind*, 83-113. Oxford: Oxford University Press.

Lee, R.B. and R. Daly (eds.)
1999 *The Cambridge Encyclopedia of Hunters and Gatherers*. Cambridge: Cambridge University Press.

Lee, R.B. and I. DeVore (eds.)
1968 *Man the Hunter*. Chicago: Aldine.

Legge, A. and P. Rowley-Conwy
1988 Star Carr revisited. London: Birkbeck College.

Lelong, O., C. Barrowman and M. Donnelly
1999 Carmichael Estate. *DES*: 82.

Lelong, O., C. Barrowman, M. Donnelly, J. Hamer and L. Sharpe
2005 People and their monuments in the Upper Clyde Valley: a programme of survey, field walking and trial excavation in the environs of the Blackhouse Burn Neolithic Enclosure, South Lanarkshire, 1998-99. *SAIR* 14. Society of Antiquaries of Scotland (http://www.sair.org.uk/sair14/index.html): Last viewed 30th January 2009.

Lelong, O. and T. Pollard
1998 Excavation of a Bronze Age ring cairn at Cloburn Quarry, Cairngryffe Hill, Lanarkshire. *PSAS* 128: 105-142.

Lemonnier, P.
1986 The Study of Material Culture Today: Towards an Anthropology of Technical Systems. *Journal of Anthropological Archaeology* 5: 147-186.

1989 Bark Capes, Arrowheads and Concord: On Social Representations of Techniques. In I. Hodder (ed.), 156-171. London: Unwin Hyman.

1990 Topsy Turvy Techniques: Remarks on Social Representation of Techniques. *Archaeological Review Cambridge* 9(1): 27-37.

Leone, M.
1982 Some opinions about recovering mind. *American Antiquity* 47: 742-760.

Leroi-Gourhan, A.
1993 [1964] *Gesture and Speech*. Cambridge: Massachusetts Institute of

Technology.

Leslie, A. F.
1995 Roman Temporary Camps in Britain. Unpublished PhD Thesis. University of Glasgow.

Lévi-Strauss, C.
1963 *Structural Anthropology*. London: Basic Books.

Lillehammer, G.
2000 The world of children. In J.R. Sofaer (ed.), 17-26. London: Routledge.

Lindgren, C.
2003 My way or your way. On the social dimension of technology as seen in the lithic strategies in eastern middle Sweden during the Mesolithic. In L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.), 177-183. Oxford: Oxbow.

Livens, R.G.
1956 Three tanged points from Scotland. *PSAS* 89: 438-443.

Low, S.M. and D. Lawrence-Zuniga
2003 Locating Culture. In S.M. Low and D. Lawrence-Zuniga (eds.), *The Anthropology of Space and Place*, 1-15. Oxford: Blackwell.

Lowe, C.
2008 *Inchmarnock: An Early Historic Island Monastery and its archaeological landscape*. Edinburgh: Society of Antiquaries of Scotland.

Lucas, G.
2005 *The Archaeology of Time*. Abingdon: Routledge.

Lyell, C.
1863 *The Geological Evidence of the Antiquity of Man*. London: John Murray.

MacEachern, S.
1998 Scale, Style, and Cultural Variation: Technological Traditions in the Northern Mandara Mountains. In M.T. Stark (ed.), 107-131. London: Smithsonian Institute Press.

MacGregor, G.
Forthcoming *Living and Dying on the Bonnie Banks: 10,000 years at The Carrick, Loch Lomond*. Edinburgh: Society of Antiquaries of Scotland.

MacGregor, G. and I. Cullen
2003 A Neolithic Structure and Bronze Age Activity at West Flank Road, Drumchapel, Glasgow. *Scottish Archaeological Journal* 25.2: 103-128.

MacGregor, G. and M. Donnelly
2001 A Mesolithic Scatter from Littlehill Bridge, Girvan, Ayrshire. *Scottish Archaeological Journal* 23(1): 1-14.

MacKie, E.W.
1969 Old Kirkpatrick. *DES*: 22.

MacNeill, M.
1965 Ballantrae; Crossraguel Abbey, Kirkoswald; Glenhead Farm; Shewalton Moor. *DES*: 13-14.

1973 Bower Hill; Dowhill Port; Dunure; Enoch Farm, Girvan; Girvan Mains; Maidens; Portencross; Seamill; West Kilbride. *DES*: 14-15.

1974 Barrassie; Culzean Bay; Dailly; Doonfoot; Loans; Maidens; Milton; Monkton; Monktonhill Farm; Portencross. *DES*: 22-23.

1975 Dreghorn; Drybridge; Kilwinning. *DES*: 57-58.

1976 Dreghorn; Dunure; Girvan; Kilwinning; Monkton; Prestwick; Stevenston; West Kilbride. *DES*: 67-68.

MacNeill, M. and S. MacLeod
1963 Shewalton Moor. *DES*: 23.

MacNeill, M. and R. McRae
1994 Bishopton. *DES*: 75.

Madsen, B.
1992 Hamburgkulturens Flintteknologi i Jels. In J. Holm and F. Rieck (eds.), 93-131. Haderslev: Skrifter fra Museumsrådet for Sønderjyllands Amt 5.

Malinowski, B.
1920 Kula: the Circulating Exchange of Valuables in the Archipelagoes of Eastern New Guinea. *Man* 20: 97-105.

1922 *Argonauts of the Western Pacific*. London: Routledge.

Mallouf, R.J.
1982 An Analysis of Plow-Damaged Chert Artifacts: the Broken Creek Cache (41HI86), Hill County, Texas. *Journal of Field Archaeology* 9: 79-98.

Marx, K.
1926 [1883] *The Eighteenth Brumaire of Louis Bonaparte*. London: G. Allen & Unwin Ltd.

Maschio, T.
1995 Mythic Images and Objects of Myth in Rauto Female Puberty Ritual. In N.C. Lutkehaus and P.B. Roscoe (eds.) *Gender rituals: female initiation in Melanesia*, 131-164. London: Routledge.

Mason, W.D.
1931 Prehistoric man at Tweed Bridge, Selkirk. *PSAS* 65: 414-417.

Mauss, M.
2002 [1922] *The Gift the Form and Reason for Exchange in Archaic Societies*. London: Routledge.

1936 Les techniques du corps. *Journal de Psychologie Normale et Pathologique* 32(3-4): 271-293 (Available online).

1947 *Manuel d'ethnographie*. Paris: Payot.

McBrearty, S., L. Bishop, T. Plummer, R. Dewar and N. Conrad
1998 Tools Underfoot: Human trampling as an agent of lithic artefact edge medication. *American Antiquity* 63(1): 108-129.

McCabe, A.M., P.U. Clark, D.E. Smith and P. Dunlop
2007 A revised model for the last deglaciation of eastern Scotland. *Journal of the Geological Society* 164: 313-316.

McCallien, W.J. and A.D. Lacaille
1941 The Cambeltown raised beach and its contained stone industry. *PSAS* 75: 55-92.

McCartan, S.B.
1998 A Surface Assemblage from Weston, Lanarkshire. Unpublished archive report. Department of Archaeology, University College, Cork.

McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman (eds.)
2009 *Mesolithic Horizons: Papers presented at the Seventh International Conference on the Mesolithic in Europe, Belfast 2005*. Oxford: Oxbow.

McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman.
2009a Preface. In McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman (eds.), xvii-xix. Oxford: Oxbow.

McDonald, J.
1882 Illustrated Notices of the Ancient Stone Implements of Ayrshire. In D. Douglas (ed.), *Archaeological and Historical Collections relating to the Counties of Ayr and Wigton Volume III*, 66-81. Edinburgh: Ayr and Wigton Archaeological Association.

McEwan, C., L.A. Borrero and A. Prieto (eds.)
1997 *Patagonia: Natural History, Prehistory and Ethnography at the uttermost end of the Earth*. London: British Museum Press.

McFadyen, L.
2006 Landscape. In C.J. Conneller and G. Warren (eds.), 121-138. Stroud: Tempus.

2008 Temporary Spaces in the Mesolithic and Neolithic: Understanding Landscapes. In J. Pollard (ed.), 121-134. Oxford: Blackwell.

McFadzean, H.
1981 Some Prehistoric sites in the Valley of the Powbrone Burn, Glengavel, Lanarkshire. Unpublished manuscript.

1983 The Scottish Stone Age: Some Implement Find-sites in Lanarkshire and

Ayrshire discovered over the years 1967-1981. Unpublished manuscript 17th October 1983.

1984 Ayrshire Mesolithic Sites. *DES*: 31-32.

1987 St. Blane's Church. *DES*: 42.

McFadzean, H., M. McFadzean and D. McFadzean
1984 Kirkholm; Loch Ryan; South of Loch Ryan; Stair Park; Torrs Warren, Luce Bay; St. Blane's Church; Avondale. *DES*: 5, 22, 31-32.

Mellars, P.A. (ed.)
1978 *The Early Postglacial Settlement of Northern Europe*. London: Duckworth.

1987 *Excavations on Oronsay: Prehistoric Human Ecology on a Small Island.* Edinburgh: Edinburgh University Press.

Mellars, P.A.
1974 The Palaeolithic and Mesolithic. In C. Renfrew (ed.), *British prehistory: a New outline*, 41-99. London: Duckworth.

1976 The appearance of "narrow blade" microlithic industries in Britain: the radiocarbon evidence. In S. K. Kozlowski (ed.), *Les Civilisations Du 8e Au 5e Millénaire Avant Notre ère En Europe*. Paris: Centre national de la recherché scientifique.

1976a Fire ecology, animal populations and man: a study of some ecological relationships in prehistory. *Proceedings of the Prehistoric Society* 42: 15-45.

1981 Towards a definition of the Mesolithic. *Mesolithic Miscellany* 2(2): 13-16.

2009 Moonshine over Star Carr: Post-processualism, Mesolithic myths and archaeological realities. *Antiquity* 83: 502-517.

Mercer, J.
1968 Stone tools from a washing-limit deposit of the highest post-glacial transgression, Lealt Bay, Isle of Jura. *PSAS* 100: 1-46.

1970 Flint tools from the present tidal zone, Lussa Bay, Isle of Jura, Argyll. *PSAS* 102: 1-30.

1971 A regression-time stone workers camp 33ft O.D. Lussa River, Isle of Jura. *PSAS* 102: 1-32.

1974 Glenbatrick waterhole, a microlithic site on the isle of Jura. *PSAS* 105: 9-32.

1980 Lussa Wood 1: the late glacial and early post-glacial occupation of Jura. *PSAS* 110: 1-31.

Merleau-Ponty, M.
1962 [1945] *Phenomenology of Perception*. London: Routledge and Kegan Paul.

Meskell, L. and R.W. Preucel (eds.)
2004 *A Companion to Social Archaeology*. Oxford: Blackwell.

2004a Identities. In L. Meskell and R.W. Preucel (eds.), 121-141. Oxford: Blackwell.

Message, K.
2010 Body without organs. In A. Parr (ed.), 37-39. Edinburgh: Edinburgh University Press.

Migal, W.
1987 Morphology of Splintered Pieces in the Light of the Experimental Method, in J.K. Rostowski and S.K. Rostowski (eds.), *New in Stone Age Archaeology*,10-33. Warsaw.

Miller, D.
1985 *Artefacts as Categories: A Study of ceramic Variability in Central India*. Cambridge: Cambridge University Press.

1987 Material Culture and Mass Consumption. Oxford: Basil Blackwell.

1994 *Modernity: An Ethnographic Approach: Dualism and Mass*. Oxford: Berg.

1998 *A Theory of Shopping*. Oxford: Blackwell Publishers.

Miller, D. and C. Tilley (eds.)
1984 *Ideology, Power and Prehistory*. Cambridge: Cambridge University Press.

1984a Ideology, power and prehistory: an introduction. In D. Miller and C. Tilley (eds.), 1-15. Cambridge: Cambridge University Press.

Miller, J. and S. Ramsay
2001 The Palaeobotanical Remains. In G. MacGregor and M. Donnelly, 10-11.

Mills, S. and A. Pannett
2009 Sounds like sociality: new research on lithic contexts in Mesolithic Caithness. In S.B. McCartan, R.J. Schulting, G. Warren and P.C. Woodman (eds.), 717-721.

Milner, N.
2005 Seasonal consumption practices in the Mesolithic: economic, environmental, social or ritual? In N. Milner and P.C. Woodman (eds.), 56-68. Oxford: Oxbow.

2006 Subsistence. In C.J. Conneller and G. Warren (eds.), 61-82. Stroud: Tempus.

Milner, N. and P.C. Woodman (eds.)
2005 *Mesolithic Studies at the Beginning of the 21st Century*. Oxford: Oxbow.

Mithen, S.J. (ed.)
2000 *Hunter-gatherer landscape archaeology: The Southern Hebrides*

Mesolithic Project 1988-98. Volume 1: Project development, palaeoenvironmental studies and archaeological fieldwork on Islay. Volume 2: Archaeological fieldwork on Colonsay, computer modelling, experimental archaeology, and final interpretations. Cambridge: McDonald Institute for Archaeological Research.

Mithen, S.J.
1989 *Thoughtful Foragers: a study of prehistoric decision makers*. Cambridge: Cambridge University Press.

1999 Hunter-gatherers of the Mesolithic. In J. Hunter and I.B.M. Ralston (eds.), *The Archaeology of Britain: An Introduction from the Upper Palaeolithic to the Industrial Revolution*, 35-57. London: Routledge.

2000a The Scottish Mesolithic: Problems and the Rationale for the *Southern Hebrides Mesolithic Project*. In S.J. Mithen (ed.), 9-37. Cambridge: McDonald Institute for Archaeological Research.

2000b The Mesolithic in the Southern Hebrides: Issues of Colonization, Settlement and the Transition to the Neolithic and Farming. In S.J. Mithen (ed.), 597-626. Cambridge: McDonald Institute for Archaeological Research.

2000c Mesolithic Sedentism on Oronsay, chronological evidence from adjacent islands in the southern Hebrides. *Antiquity* 74: 298-304.

nd. The Inner Hebrides Archaeological Project. University of Reading (http://www.reading.ac.uk/archaeology/research/Projects/arch-project-IHAP.aspx). Last viewed 3rd June 2011.

Mithen, S.J. and N. Finlay
2000 Staosnaig, Colonsay: Excavations 1989-1995. In S.J. Mithen (ed.), 359-441. Cambridge: McDonald Institute for Archaeological Research.

2000a Coulererach, Islay: Test-pit Survey and Trial Excavation. In S.J. Mithen (ed.), 217-229. Cambridge: McDonald Institute for Archaeological Research.

Mithen, S.J., N. Finlay and T. Phillips
2000 Rockside, Islay: Test-pit Survey and Trial Excavation. In S.J. Mithen (ed.), 207-216. Cambridge: McDonald Institute for Archaeological Research.

Mithen, S.J. and B. Finlayson
1991 Red deer hunters on Oronsay? The implications of Staosnaig for the interpretation of the Oronsay middens. *Proceedings of the Prehistoric Society* 57(2): 1-8.

2000 Gleann Mor, Islay: Test-pit Survey and Trial Excavation. In S.J. Mithen (ed.), 187-205. Cambridge: McDonald Institute for Archaeological Research.

Mithen, S.J. and M. Lake
1996 The Southern Hebrides Mesolithic Project: Reconstructing Mesolithic

Settlement in Western Scotland. In T. Pollard and A. Morrison (eds.), 123-151. Edinburgh: Edinburgh University Press.

Mithen, S.J., M. Lake and N. Finlay
2000 Bolsay Farm, Islay: Test-pit Survey and Trial Excavation. In S.J. Mithen (ed.), 259-289. Cambridge: McDonald Institute for Archaeological Research.

Mithen, S.J., A. Pirie, S. Smith and K. Wicks
2007 The Mesolithic-Neolithic transition in western Scotland: a review and new evidence from Tiree. In A. Whittle and V. Cummings (eds.), 511-541. Oxford: British Academy.

Mithen, S.J., P.E. Woodman, N. Finlay and B. Finlayson
2000 Aoradh, Islay: Test-pit Survey and Trial Excavation. In S.J. Mithen (ed.), 231-239. Cambridge: McDonald Institute for Archaeological Research.

Momber, G.
2007 Submerged in Mesolithic Archaeology. In C. Waddington and K. Pedersen (eds.), 33-39. Oxford: Oxbow.

Moore, J.
2003 Beyond hazelnuts and into the forest. In L. Bevan and J. Moore (eds.), 53-58. Oxford: BAR.

Moore, J. and E. Scott (eds.)
1997 *Invisible People and Processes: Writing Gender and Childhood into European Archaeology*. Leicester: University of Leicester.

Moore, J.C.
1881 Notice of Ancient graves at Dounan, near Ballantrae, Ayrshire. *PSAS* 15: 278-279.

Moore, J.C. and J.A. Smith
1885 Notice of Ancient Graves at Dounan, near Ballantrae, Ayrshire. In D. Douglas (ed.), *Archaeological and Historical Collections relating of Ayrshire and Galloway Volume V*, 9-12. Edinburgh: Ayrshire and Galloway Archaeological Association.

Morphy, H.
1988 Maintaining cosmic unity: ideology and the reproduction of Yolngu clans. In T. Ingold, D. Riches and J. Woodburn (eds.) 1988a, 248-271. Oxford: Berg.

Morrison, A.
1980 *Early Man in Britain and Ireland: An Introduction to Palaeolithic and Mesolithic Cultures*. London: Crook Helm.

1982 Man in the Early Scottish Environment: Comment on Price. *Scottish Archaeological Review* 1-2: 73-77.

1982a The Mesolithic Period in South-West Scotland: A Review of the Evidence.

Glasgow Archaeological Journal 9: 1-14.

1996 John Smith and the Earlier Prehistory of Ayrshire. In D. Reid (ed.), *John Smith of Dalry: Geologist, Antiquarian and Natural Historian. Part 2: Archaeology and Natural History*, 11-33. Darvel: Ayrshire Archaeological and Natural History Society (Ayrshire Monographs No.17).

1996a 'The Northward March of Palaeolithic Man in Britain': An appreciation of Armand Donald Lacaille. In T. Pollard and A. Morrison (eds.), 1-19. Edinburgh: Edinburgh University Press.

Morrison, A. and C. Bonsall
1989 The early Post-Glacial settlement of Scotland: a review. In C. Bonsall (ed.), 134-142. Edinburgh: John Donald Publishers Ltd.

Morrison, A. and I. Hughes
1989 *The Stone Ages in Ayrshire*. Darvel: Ayrshire Archaeological and Natural History Society.

Morton, J.
1988 Comment to Testart. *Current Anthropology* 29(1): 18-20.

Nash, G.
2003 Settlement, population dynamics and territoriality during the late South Scandinavian Mesolithic. In L. Bevan and J. Moore (eds.), 159-170. Oxford: BAR.

Neilsen, A.E.
1991 Trampling the Archaeological Record: An Experimental Study. *American Antiquity* 56(3): 483-503.

Nelson, M.C.
1991 The Study of Technical Organization. *Archaeological Method and Theory* 3: 57-100.

Newall, F.
1960 Craigmarloch, Gourock Golf Course and Lurg Moor. *DES*: 33-34.

1961 Early Open Settlement in Renfrewshire. *PSAS* 95: 159-170.

1963 Lawpark, East Green Farm. *DES*: 47.

1965 Duchal Mains. *DES*: 35.

1966 Gryfe Reservoir: South and South-East Areas. *DES*: 40.

1967 Quarrier's Homes. *DES*: 46.

Ohnuma, K. and C. Bergman
1982 Experimental Studies in the Determination of Flaking Mode. *Bulletin of the Institute of Archaeology*: 161-170.

Orquera, L.A.
2005 Mid-Holocene littoral adaptation at the southern end of South America. *Quaternary International* 132: 107-115.

Orquera, L. A. and E.L. Piana
2009 Sea Nomads of the Beagle Channel in southernmost South America: Over Six thousand Years of Coastal Adaptation and Stability. *Journal of Island and Coastal Archaeology* 4(1): 61-81.

Orton, C.
2000 *Sampling in Archaeology*. Cambridge: Cambridge University Press.

Owen, A.W., H.A. Armstrong and J.D. Floyd
1999 Rare earth element geochemistry of upper Ordovician cherts from the Southern Uplands of Scotland. *Journal of the Geological Society* 156: 191-204.

1999a Rare earth elements in chert clasts as provenance indicators in the Ordovician and Silurian of the Southern Uplands of Scotland. *Sedimentary Geology* 124: 185-195.

Owens, D'A. and B. Hayden
1997 Prehistoric Rites of Passage: A Comparative Study of Transegalitarian Hunter-Gatherers. *Journal of Anthropological Archaeology* 16: 121-161.

Pannett, A.
2007 A Post Processual Flight of Fancy? Microlith Production and the Enculturation of Landscape in the Mesolithic of Caithness. In C. Waddington and K. Pedersen (eds.), 151-158. Oxford: Oxbow.

Pannett, A. and A. Baines
2006 Making Things, Making Places: The Excavation of Flint Knapping Sites at Oliclett, Caithness. *SAJ* 28(1): 1-26.

Parker Pearson, M.
2000 [1982] Mortuary practices, society and ideology: an ethnoarchaeological study. In J. Thomas (ed.). London: Leicester University Press.

Parr, A. (ed.)
2010 *The Deleuze Dictionary*. Edinburgh: Edinburgh University Press.

Parr, A.
2010a Repetition. In A. Parr (ed.), 225-226. Edinburgh: Edinburgh University Press.

Paterson, H.M.L.
1913 Pygmy flints in the Dee Valley. *Man*, 103-105.

Paterson, H.M.L. and A.D. Lacaille
1936 Banchory microliths. *PSAS* 70: 419-434.

Patton, P.
2009 Events, Becoming and History. In J.A. Bell and C. Colebrook (eds.), 33-53.

Edinburgh: Edinburgh University Press.

Pétrequin, P. and A-M. Pétrequin
2000 [1993] *Écologie d'un outil: la hache de pierre en Irian Jaya (Indonésie).* Paris: CRNS.

Pfaffenberger, B.
1992 Social Anthropology of Technology. *Annual Review of Anthropology* 21: 491-516.

2001 Symbols Do Not Create Meanings - Activities Do: Or, Why Symbolic Anthropology Needs the Anthropology of Technology. In M.B. Schiffer (ed.), 77-86. Albuquerque: University of New Mexico Press.

Pielou, E. C.
1966 The measurement of diversity in different types of biology collections. *Journal of Theoretical Biology* 13: 131-144.

Pinney, C. and N. Thomas (eds.)
2001 *Beyond Aesthetics: Art and the Technologies of Enchantment.* Oxford: Berg.

Pirie, A., P.A. Mellars and S.J. Mithen
2006 Cnoc Coig: a Mesolithic Shell midden assemblage. *Lithics* 27:4-11.

Pirsig, R. M.
1984 [1974] *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values.* New York: Bantam Books.

Pluciennik, M.
2008 The Coastal Mesolithic of the European Mediterranean. In G. Bailey and P. Spikins (eds.), 328-356. Cambridge: Cambridge University Press.

Pollard, J. (ed.)
2008 *Prehistoric Britain.* Oxford: Blackwell.

Pollard, T.
1993 Kirkhill Farm (Johnstone Parish): Mesolithic flint scatter with associated features and burnt mound. *DES*: 15.

1996 Time and tide: Coastal Environments, Cosmology and Ritual Practice in Early Prehistoric Scotland. In T. Pollard and A. Morrison (eds.), 198-210. Edinburgh: Edinburgh University Press.

2000 Risga and the Mesolithic occupation of Scottish Islands. In R. Young (ed.), 174-184. Leicester: University of Leicester.

Pollard, T. and A. Morrison (eds.)
1996 *The Early Prehistory of Scotland.* Edinburgh: Edinburgh University Press.

Preucel, R.W. (ed.)
1991 *Processual and Postprocessual Archaeologies: Multiple Ways of Knowing the Past.* Carbondale: Southwestern Illinois University Occasional Paper

10.

Price, S.
2005 Can't See the Trees for the Wood: The Social Life of Trees in the Mesolithic of Southern Scandinavia. In H.L. Cobb, F. Coward, L. Grimshaw and S. Price (eds.), 95-105. Oxford: BAR.

Price, T.D. and J.A. Brown
1985 Aspects of hunter-gatherer complexity. In T.D. Price and J.A. Brown (eds.) *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity*, 3-20. Academic Press: Orlando.

Pugsley, L.B.
2005 Sex, gender and sexuality in the Mesolithic. In N. Milner and P.C. Woodman (eds.), 164-175. Oxford: Oxbow.

Rankama, T.
2009 Quartz analyses of the Kaarenskoski site, Lapland. In McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman (eds.), 813-819. Oxford: Oxbow.

Rankama, T., M. A. Manninem, E. Hertell and M. Tallavaara
2006 Simple production and social strategies: do they meet? Social dimensions in Eastern Fennoscandian quartz technologies. In J. Apel and K. Knutsson (eds.), 245-261. Uppsala: SAU.

Renfrew, C.
1994 Towards a cognitive archaeology. In C. Renfrew and E.B.W. Zubrow (eds.), 3-12. Cambridge: Cambridge University.

Renfrew, C. and E.B.W. Zubrow (eds.)
1994 *The Ancient Mind: Elements of Cognitive Archaeology*. Cambridge: Cambridge University Press.

Reynier, M.J.
2000 Thatcham Revisited: Spatial and Stratigraphic Analyses of Two Sub-assemblages from Site III and its implications for Early Mesolithic Typo-chronology in Britain. In R. Young (ed.), 33-46. Leicester: University of Leicester.

2005 *Early Mesolithic Britain: Origins, development and directions*. Oxford: BAR.

Reynolds, P.C.
1993 The Complementation Theory of Language and Tool Use. In K.R. Gibson and T. Ingold (eds.), 407-428. Cambridge: Cambridge University Press.

Richards, M.P.
2004 The Early Neolithic in Britain: new insights from biomolecular archaeology. In I.A. Shepherd and G.J. Barclay (eds.), 83-90. Edinburgh: Society of Antiquaries of Scotland.

Richards, M.P. and P.A. Mellars
1998 Stable isotope analysis and the seasonality of the Oronsay middens.

Antiquity 72: 178-184.

Ritchie, G. (ed.)
1997 *The Archaeology of Argyll*. Edinburgh: Edinburgh University Press.

Robinson, D.
1983 Possible Mesolithic activity in the west of Arran: evidence from peat deposits. *GAJ* 10: 1-6.

Rosenau, P.M.
1992 *Post-modernism and the Social Sciences*. Princeton: Princeton University Press.

Rossignol, J. and L. Wandsnider (eds.)
1992 *Space, Time, and Archaeological Landscapes*. London: Plenum Press.

Rowley-Conwy, P.A., M. Zvelebil and H.P. Blankholm (eds.)
1987 *Mesolithic Northwest Europe: recent trends*. Sheffield: University of Sheffield.

Rowley-Conwy, P.A., M. Zvelebil and H.P. Blankholm
1987a Introduction: Aspects of Recent Research on the European Mesolithic. In P.A. Rowley-Conwy, M. Zvelebil and H.P. Blankholm (eds.), 1-5. Sheffield: University of Sheffield.

Rozoy, J.G.
1978 *Les Derniers Chasseurs: L'Epipaleolithique En France Et En Belgique: Essai De Synthese*. Charleville: Societe Archaeologique Champenoise.

Ryan, P. And J. Blackford
2009 Late Mesolithic Environmental Change in the Upland Zone of Britain: High Resolution Records of Woodland Disturbance and Fire. In P. Crombé, M. van Strydonck, J. Sergant, M. Boudin and M. Bats (eds.), 591-613. Newcastle upon Tyne: Cambridge Scholars.

Sackett, J.R.
1982 Approaches to Style in Archaeology. *Journal of Anthropological Archaeology* 1(1): 59-112.

1990 Style and Ethnicity in Archaeology: The Case for Isochrestism. In M.W. Conkey and C. Hastorf (eds.), 32-43. Cambridge: Cambridge University Press.

Sahlins, M.D.
1974 *Stone Age Economics*. London: Tavistock Publications.

1981 *Historical Metaphors and Mythical Realities: Structure in the Early history of the Sandwich Islands Kingdom*. Ann Arbor: University of Michigan Press.

Sahlins, M.D. and E.R. Service (eds.)
1960 *Evolution and Culture*. Ann Arbor: University of Michigan.

Saville, A. (ed.)
2004 *Mesolithic Scotland and Its Neighbours: The Early Holocene Prehistory of Scotland, its British and Irish Context and some Northern European Perspectives*. Edinburgh: Society of Antiquaries of Scotland.

Saville, A.
1994 Exploitation of lithic resources for stone tools in earlier pre-historic Scotland. In N. Ashton and A. David (eds.), *Stories in Stone*, 57-70. London: Lithic Studies Society.

1998 Studying the Mesolithic Period in Scotland: A Bibliographic Gazetteer. In N. Ashton, F. Healy and P. Pettitt (eds.), 211-224. Oxford: Oxbow.

2003 Indications of regionalisation in Mesolithic Scotland. In Larsson, L., H. Kindgren, K. Knutsson, D. Loeffler and A. Åkerlund (eds.), 340-350. Oxford: Oxbow.

2004a Introducing Mesolithic Scotland: the Background to a Developing Field of Study. In A. Saville (ed.), 3-24. Edinburgh: Society of Antiquaries of Scotland.

2004b The Material Culture of Mesolithic Scotland. In A. Saville (ed.), 185-220. Edinburgh: Society of Antiquaries of Scotland.

2004c Auchenmalg; Shalunt. *DES*: 38; 33.

2008 The Beginning of the Later Mesolithic in Scotland. In Z. Sulgostowska and A.J. Tomaszewski (eds.), *Man - Millennia - Environment: Studies in Honour of Romuald Schild*, 207-213. Warsaw: Institute of Archaeology and Ethnology; Polish Academy of Sciences.

2008a Flint extraction and processing from secondary flint deposits in the north-east of Scotland in the Neolithic period. In P. Allard, F. Bostyn, F. Giligny and J. Lech (eds.), *Flint Mining in Prehistoric Europe: Interpreting the archaeological records*, 1-10. Oxford: BAR.

Saville, A. and T.B. Ballin
2003 An Ahrensbergian-type tanged point from Shieldaig, Wester Ross, Scotland and its implications. *Oxford Journal of Archaeology* 22(2): 115-131.

2009 Upper Palaeolithic evidence from Kilmelfort Cave, Argyll: a re-evaluation of the lithic assemblage. *PSAS* 139: 9-46.

Saville, A., T.B. Ballin and T. Ward
2007 Howburn, near Biggar, South Lanarkshire: Preliminary Notice of a Scottish Inland Early Holocene Lithic Assemblage. *Lithics: The Journal of the Lithic Studies Society* 28: 41-49.

Saville, A. and R. Miket
1994 An Corran rock shelter, Skye: a major new Mesolithic site. *Past* 18: 9-10.

Saville, A. and C.R. Wickham-Jones
2010 History of Palaeolithic and Mesolithic studies in Scotland. In J. Saunders

(ed.) Draft ScARF report. Edinburgh: Society of Antiquaries of Scotland.

Schalk, R.F.
1981 Land use and organisational complexity amongst foragers of Northwestern North America. In S. Koyama and D.H. Thomas (eds.) *Affluent Forager: Pacific Coasts East and West*, 53-75. Senri Ethological Studies 9.

Schick, K. and N. Toth
1993 *Making Silent Stones Speak: Human Evolution and the Dawn of technology*. London: Weidenfield and Nicholson.

Schiffer, M.B. (ed.)
2001 *Anthropological Perspectives on Technology*. Albuquerque: University of New Mexico Press.

Schiffer, M.B.
1972 Archaeological context and systemic context. *American Antiquity* 37: 156-165.

2002 [1976] *Behavioral Archaeology*. Clinton Corners: Percheron Press.

2001a Toward an Anthropology of Technology. In M.B. Schiffer (ed.), 1-15. Albuquerque: University of New Mexico Press.

2001b The Explanation of Long-Term Technological Change. In M.B. Schiffer (ed.), 215-235. Albuquerque: University of New Mexico Press.

Schiffer, M.B. and J.M. Skibo
1987 Theory and Experiment in the Study of Technological Change. *Current Anthropology* 28(5): 595-622.

Schlanger, N.
1994 Mindful Technology: unleashing the *chaîne opératoire* for an archaeology of mind. In C. Renfrew and E.B.W. Zubrow (eds.), 143-151. Cambridge: Cambridge University Press.

Schlanger, S.H.
1992 Recognizing persistent places in Anasazi settlement systems. In J. Rossignol and L. Wandsnider (eds.), 91-112. London: Plenum Press.

Schneider, J. and A.B. Weiner
1986 Cloth and the Organization of Human Experience. *Current Anthropology* 27(2): 178-184.

Schofield, A.J. (ed.)
1991 *Interpreting Artefact Scatters: Contributions to Ploughzone Archaeology*. Oxbow: Oxford.

1995 *Lithics in Context: Suggestions for the future direction of lithic studies*. London: Lithic Studies Society.

Schofield, A.J.
1995a Artefacts mean nothing. In A. J. Schofield (ed.), 3-8. London: Lithic

Studies Society.

1995b Settlement mobility and *la longue durée*: towards a context for surface lithic material. In A. J. Schofield (ed.), 105-113. London: Lithic Studies Society.

Schulting, R.J. and M.P. Richards
2000 The Use of Stable Isotopes in Studies of Subsistence and Seasonality in the British Mesolithic. In R. Young (ed.), 55-65. Leicester: University of Leicester.

2002 The wet, the wild and the domesticated: the Mesolithic-Neolithic transition on the west coast of Scotland. *European Journal of Archaeology* 5(2): 147-189.

Shankar, S.
2006 Metaconsumptive Practices and the Circulation of Objectifications. *Journal of Material Culture* 11(3): 293-317.

Shanks, M.
1992 *Experiencing the Past: on the Character of Archaeology*. London: Routledge.

Shanks, M. and I. Hodder
1995 Processual, postprocessual and interpretive archaeologies. In I. Hodder, M. Shanks, A. Alexandri, V. Buchli, J. Carman, J. Last and G. Lucas (eds.), 3-29. London: Routledge.

Shanks, M. and C. Tilley
1987 *Re-constructing Archaeology*. Cambridge: Cambridge University Press.

Sharpe, L. and C. Barrowman
1998 Garvald. *DES*: 80.

Shepherd, I.A. and G.J. Barclay (eds.)
2004 *Scotland in Ancient Europe: The Neolithic and Early Bronze Age of Scotland in their European Context*. Edinburgh: Society of Antiquaries of Scotland.

Shepherd, W.
1972 *Flint: Its Origin, Properties and Uses*. London: Faber and Faber.

Shott, M.J.
2008 Lower Palaeolithic Industries, Time, and the Meaning of assemblage Variation. In S. Holdaway and L. Wandsnider (eds.), 46-60. Salt Lake City: University of Utah Press.

Sillitoe, P. and K. Hardy
2003 Living Lithics: ethnoarchaeology in Highland Papua New Guinea. *Antiquity* 77(3): 555-566.

Simmel, G.
1978 [1957] *The philosophy of money*. London: Routledge. (Previously: Fashion.

American Journal of Sociology LXII: 541-548).

Simmons, I.G., G.W. Dimpleby and C. Grigson
1981 The Mesolithic. In I. G. Simmons and M. J. Tooley (eds.), *The Environment in British Prehistory*, 82-124. London: Duckworth.

Skibo, J.M. and M.B. Schiffer
2001 Understanding Artifact Variability and Change: A Behavioral Framework. In M. B. Schiffer (ed.), 139-149. Albuquerque: University of New Mexico Press.

Sludden, K.R.
2004 The Cataloguing of Professor Ian Muirhead's Lithic Collection, held at the Hunterian Museum, Glasgow. Unpublished Undergraduate Dissertation: University of Glasgow.

Smith, A.G.
1970 The influence of Mesolithic and Neolithic man on British vegetation: a discussion. In D. Walker and R. G. West (eds.), *Studies in the Vegetational History of the British Isles*, 81-96. Cambridge: Cambridge University Press.

Smith, D.E., R.A. Cullingford, T.M. Mighall, J.T. Jordan and P.T. Fretwell
2007 Holocene relative sea level changes in a glacio-isostatic area: New data from south-west Scotland, United Kingdom. *Marine Geology* 242: 5-26.

Smith, D.E., P.T. Fretwell, R.A. Cullingford and C.R. Firth
2006 Towards improved empirical isobase models of Holocene land uplift for mainland Scotland, UK. *Philosophical Transactions of the Royal Society A* 364: 949-972.

Smith, J.
1882 On the occurrence of flint nodules and worked flints in the post-Tertiary sands of the Ayrshire coast between Saltcoats and Troon. *Transactions of the Geological Society of Glasgow* 6: 185-191.

1893 The sand-hills of Torrs Warren, Wigtownshire. *Transactions of the Geological Society of Glasgow* 6: 185-191.

1895 *Prehistoric Man in Ayrshire*. London: Elliot Stock.

1896 The geological position of the Irvine whale bed. *Transactions of the Geological Society of Glasgow* 10: 29-50.

1908 Torrs Warren. *Annals of the Andersonian Naturalists' Society* 3: 35-52.

Sofaer, J.R. (ed.)
2000 *Children and Material Culture*. London: Routledge.

Sofaer, J.R.
2000a Material culture shock: Confronting expectations in the material culture of children. In J.R. Sofaer (ed.), 3-16. London: Routledge.

2006 *The Body as Material Culture: A Theoretical Osteoarchaeology*. Cambridge: Cambridge University Press.

Sørensen, M.
2006 The new dynamic technological blade definition and Maglemosian blades. In J. Apel and K. Knutsson (eds.), 282-291. Uppsala: SAU.

2008 Spatial Analysis by Dynamic Technological Classification: a Case Study from the Palaeolithic-Mesolithic Transition in Scandinavia. In M. Sørensen, and P. Desrosiers (eds.), 105-121. Copenhagen: PNM.

Sørensen, M. and P. Desrosiers (eds.)
2008 *Technology in Archaeology*. Copenhagen: PNM.

Spencer, R.
1976 *The North Alaskan Eskimo*. New York: Dover.

Spikins, P.
1999 *Mesolithic Northern England. Environment, population and settlement*. Oxford: BAR.

2000 Ethno-facts or ethno-fiction? Searching for the structure of settlement patterns. In R. Young (ed.), 105-118. Leicester: University of Leicester.

2002 *Prehistoric People of the Pennines: Reconstructing the lifestyles of Mesolithic hunter-gatherers on Marsden Moor*. Leeds: West Yorkshire Archaeology Service.

2008 Mesolithic Europe: Glimpses of Another World. In G. Bailey and P. Spikins (eds.), 1-17. Cambridge: Cambridge University Press.

Spriggs, M. and A. Anderson
1993 Late colonisation of East Polynesia. *Antiquity* 67: 200-217.

St. Joseph, J.X.S. and G.S. Maxwell
1982 Girvan Mains, Ayrshire. *DES*: 29.

Stagoll, C.
2010 Becoming. In A. Parr (ed.), 25-27. Edinburgh: Edinburgh University Press.

Stark, M.T. (ed.)
1998 *The Archaeology of Social Boundaries*. London: Smithsonian Institution Press.

1998a Technical Choices and Social Boundaries in Material Culture Patterning: An Introduction. In M.T. Stark (ed.), 1-11. London: Smithsonian Institution Press.

Sternke, F.
2005 All are not hunters that knap the stone - a search for a woman's touch in Mesolithic stone tool production. In N. Milner and P.C. Woodman (eds.), 144-163. Oxford: Oxbow.

Sternke, F. And M. Sørenson
2009 The identification of children's flint knapping products in Mesolithic Scandinavia. In McCartan, S.B., R.J. Schulting, G. Warren and P.C. Woodman (eds.), 722-729. Oxford: Oxbow.

Stets, J.E. and P.J. Burke
2000 Identity and Social Identity Theory. *Social Psychology Quarterly* 63(3): 224-337.

Stout, D.
2002 Skill and Cognition in Stone Tool Production: An Ethnographic Case Study from Irian Jaya. *Current Anthropology* 43(5): 693-722.

Strathern, M.
1988 *The Gender of the Gift: Problems with Women and Problems with Society in Melanesia.* Berkeley: University of California Press.

Straus, L.G.
2008 Palimpsests, assemblages, phases & facies: The conundrum of taxonomic generalizations from particular archaeological cases. In T. Aubry, F. Almeida, A. C. Araújo and M. Tiffagom (eds.), 215-222. Oxford: BAR.

Sullivan, A.P.
2008 Time Perspectivism and the Interpretive Potential of Palimpsests: Theoretical and Methodological Considerations of Assemblage Formation History and Contemporaneity. In S. Holdaway and L. Wandsnider (eds.), 31-45. Salt Lake City: University of Utah Press.

Svoboda, J.A.
2008 The Mesolithic of the Middle Danube and Upper Elbe Rivers. In G. Bailey and P. Spikins (eds.), 221-237. Cambridge: Cambridge University Press.

Swann, D.
2006 6 Shell Knowe, Ballantrae. *DES*: 157.

Taçon, P.S.C.
1999 Identifying ancient sacred landscapes in Australia: from physical to social. In W. Ashmore and A.B. Knapp (eds.) *Archaeologies of Landscape: Contemporary Perspectives*, 33-57. Oxford: Wiley-Blackwell.

Testart, A.
1988 Some Major Problems in the social Anthropology of Hunter-Gatherers. *Current Anthropology* 29(1): 1-32.

Thom, B.
2009 The paradox of boundaries in Coast Salish territories. *Cultural Geographies* 16: 179-205.

Thomas, J. (ed.)
2000 *Interpretive Archaeology: a reader*. London: Leicester University Press.

Thomas, J.
1990 Some, other, analogue: Writing the Past in the Present. In F. Baker and J. Thomas (eds.), 18-23. Writing the Past in the Present. Lampeter: St. David's University College.

2002 Materialism and power. *Cambridge Archaeological Journal* 12(1), 140-142.

2008 Past Practices: Rethinking Individuals and Agents in Archaeology: Comments from Julian Thomas. *Cambridge Archaeological Journal* 18(1): 26-28.

2008a The Mesolithic-Neolithic Transition in Britain. In J. Pollard (ed.), 58-89. Oxford: Blackwell.

Thomas, N.
2001 Introduction. In C. Pinney and N. Thomas (eds.), 1-12. Oxford: Berg.

Tilley, C. (ed.)
1993 *Interpretive Archaeology*. Providence: Berg.

Tilley, C.
1989 Interpreting material culture. In I. Hodder (ed.), 185-194. London: Unwin Hyman.

1989a Excavation as theatre. *Antiquity* 63: 275-280.

1993a Interpretation and a Poetics of the Past. In C. Tilley (ed.), 1-27. Providence: Berg.

1994 *A Phenomenology of Landscape: Places, Paths and Monuments*. Oxford: Berg.

1996 *An Ethnography of the Neolithic: Early Prehistoric Societies in Southern Scandinavia*. Cambridge: Cambridge University Press.

1999 *Metaphor and Material Culture*. Oxford: Blackwell Publishers.

2006 Objectification. In C. Tilley, W. Keane, S. Küchler, M. Rowlands and P. Spyer (eds.), 60-73. London: Sage.

Tilley, C., W. Keane, S. Küchler, M. Rowlands and P. Spyer (eds.)
2006 *Handbook of Material Culture*. London: Sage.

Ting, S.
1937 Storm waves and shore-forms of south-western Scotland. *Geological Magazine* 74: 132-141.

Tipping, R.
1995 Holocene evolution of a lowland Scottish landscape: Kirkpatrick. II. Regional vegetation and land-use change. *The Holocene* 5(1): 83-96.

2004 Interpretative Issues Concerning the Driving Forces of Vegetation Change in the Early Holocene of the British Isles. In A. Saville (ed.), 45-53.

Edinburgh: Society of Antiquaries of Scotland.

Tixier, J., M-L. Inizan and H. Roche
1980 *Préhistoire de la pierre taillée, 1 terminologie et technologie*. Valbonne: CREP.

Tolan-Smith, C.
2001 *The caves of Mid Argyll: An Archaeology of Use*. Edinburgh: Society of Antiquaries of Scotland.

2008 Mesolithic Britain. In G. Bailey and P. Spikins (eds.), 132-157. Cambridge: Cambridge University Press.

Torrence, R. (ed.)
1989 *Time, Energy and Stone Tools*. Cambridge: Cambridge University Press.

Torrence, R.
1978 Chipping away at some misconceptions about sampling lithic assemblages. In J. Cherry, C. Gamble and S. Shennan (eds.), 373-398. Oxford: BAR.

1983 Time budgeting and hunter-gatherer technology. In G. Bailey (ed.), *Hunter-Gatherer Economy in Prehistory: A European Perspective*, 11-22. Cambridge: Cambridge University Press.

1989a Tools as optimal solutions. In R. Torrence (ed.), 1-6. Cambridge: Cambridge University Press.

Tremblay, J-M.
2008 Les Classiques des science sociales. Université du Québec (http://classiques.uqac.ca/classiques/mauss_marcel/socio_et_anthropo/6_Techniques_corps/Techniques_corps.html) (Last viewed 28th October 2009).

Trigger, B.R.
1989 *A History of Archaeological Thought*. Cambridge: Cambridge University Press.

2004 Cross-Cultural Comparison and Archaeological Theory: A Historical and Contemporary Perspective. In L. Meskell and R.W. Preucel (eds.), 43-65. Oxford: Blackwell.

Truckell, A.E.
1962 The Mesolithic in Dumfries and Galloway: Recent Developments. *TDGNHAS* 40: 43-47.

Trudeau, D.
2006 Politics of belonging in the construction of landscapes: place making, boundary-drawing and exclusion. *Cultural Geographies* 13: 421-443.

Turnbull, C.M.
1974 [1961] *The Forest People*. London: Book Club Associates.

1978 The politics of non-aggression (Zaire). In A. Montagu (ed.) *Learning non-*

aggression: the experience of non-literate societies, 161-221. New York: Oxford University Press,

1983 *The Mbuti Pygmies: Change and Adaptation*. New York: Holt, Rinehart and Winston.

Turner, V.W.
1969 *The Ritual Process: Structures and Anti-Structure*. London: Routledge and K. Paul.

University of Edinburgh
2010 Geology Roam® at Edina Resource. (http://digimap.edina.ac.uk/geologymapper/geologymapper;jsessionid=DE1DAB95C9EF77E3C93D77F97417E55D?execution=e1s1). Last viewed 23rd June 2011.

University of Hawaii
nd. How to calculate the Shannon-Weaver Diversity Index (www.biology.hawaii.edu/301L/Spring/ppt/Shannon-Weaverpp.ppt). Last viewed 13th July 2011.

Valdeyron, N.
2008 The Mesolithic in France. In G. Bailey and P. Spikins (eds.), 182-202. Cambridge: Cambridge University Press.

Valentin, B.
2008 Typologie vs Typologie (*SIC*!). Comment la technologie contribue à raffiner la typologie des armatures lithiques. In T. Aubry, F. Almeida, A. C. Araújo and M. Tiffagom (eds.), 189-196. Oxford: BAR.

Van Den Brink, J.H.
1974 *The Haida Indians*. Leiden: E. J. Brill.

Vermeersch, M. and P. Van Peer (eds.)
1990 *Contributions to the Mesolithic in Europe: Papers Presented at the Fourth International Symposium 'The Mesolithic in Europe', Leuven 1990*. Leuven: Leuven University Press.

Vidal, H.N.J.
1999 The Yamana of Tierra del Fuego. In R.B. Lee and R. Daly (eds.), 114-118. Cambridge: Cambridge University Press.

Viveiros de Castro, E.
2010 Intensive Filiation and Demonic Alliance. In C.B. Jensen and K. Rödje (eds.), 219-253. New York: Berghahn.

Waddington, C. (ed.)
2007 *Mesolithic Settlement in the North Sea Basin: A Case Study from Howick, North-East England*. Oxford: Oxbow Books.

Waddington, C.
2007a Excavation of the Howick Hut. In C. Waddington (ed.), 34-64. Oxford: Oxbow Books.

Waddington, C., G. Bailey and N. Milner
2007 Howick: Discussion and interpretation. In C. Waddington (ed.), 189-202. Oxford: Oxbow.

Waddington, C. and K. Pedersen (eds.)
2007 *Mesolithic Studies in the North Sea Basin and Beyond: Proceedings of a Conference held at Newcastle in 2003*. Oxford: Oxbow Books.

Wagstaff, M.
1991 The archaeological site from a geographic perspective. In A.J. Schofield (ed.), 9-10. Oxford: Oxbow.

Walker, M.
1973 Archaeological excavation of a microlithic assemblage at Shieldaig, Wester Ross, Scotland. 24/iii/73-6/iv/73: preliminary report. Unpublished typescript: RCAHMS.

Walker, W.H.
2001 Ritual Technology in an Extranatural World. In M.B. Schiffer (ed.), 87-106. Albuquerque: University of New Mexico Press.

Walsh, K.
1990 The Post-Modern threat to the past. In I. Bapty and T. Yates (eds.), 278-293. London: Routledge.

Ward, T.
1991 Cornhill. *DES*: 65-66.

1995 Cornhill; Daer Reservoir (Sites 1 and 2). *DES*: 87.

1996 Cornhill. *DES*: 99.

1997 Cornhill; Daer Reservoir (Sites 1 and 2). *DES*: 75-76.

1998 Cornhill; Weston Farm; Daer Reservoir (Sites 1 and 2). *DES*: 90, 128.

1999 Carwood Farm; Cornhill; Weston Farm. *DES*: 82-83.

2000 Daer Reservoir and Daer Reservoir Site 3; Weston Farm. *DES*: 85-86.

2001 Daer Reservoir Site 3. *DES*: 91-92, 127.

2003 Daer Reservoir Site 5; Weston Farm. *DES*: 123-124.

2004 Excavations in Megget Reservoir. Biggar Museum Trust (http://www.biggararchaeology.org.uk/projects.php) Last viewed 9th February 2009.

2004a The discovery and excavation of a Mesolithic site in Daer Valley (Site 85). Biggar Museum Trust (http://www.biggararchaeology.org.uk/projects.php) Last viewed 9th February 2009.

2004b Upper Tweed Archaeological Survey. Biggar Museum Trust (http://www.biggararchaeology.org.uk/projects.php) Last viewed 9th February 2009.

2005 Brownsbank Farm; Coomb Rig: Sites 84 and 85 (Daer Valley Project); Weston Farm. *DES*: 132, 134, 135, 179, 180.

2005a Fieldwork and excavations at nether Hangingshaw Farm, Coulter by Biggar, South Lanarkshire. Biggar Museum Trust (http://www.biggararchaeology.org.uk/projects.php) Last viewed 9th February 2009.

2005b The discovery and excavation of a Mesolithic site in Daer Valley (Site 84). Biggar Museum Trust (http://www.biggararchaeology.org.uk/projects.php) Last viewed 9th February 2009.

2006 Excavations at Weston Farm 2003-2004. Biggar Museum Trust (http://www.biggararchaeology.org.uk/projects.php) Last viewed 9th February 2009.

Warren, G.

2000 Seascapes: people, boats and inhabiting the later Mesolithic in western Scotland. In R. Young (ed.), 97-104. Leicester: University of Leicester.

2001 Marking space? Stone tool deposition in Mesolithic and early Neolithic eastern Scotland. In M. Zvelebil and K. Fewster (eds.), 91-100. Oxford: BAR.

2004 The start of the Neolithic in Scotland. In I.A. Shepherd and G.J. Barclay (eds.), 91-102. Edinburgh: Society of Antiquaries of Scotland.

2005 *Mesolithic Lives in Scotland*. Stroud: Tempus.

2005a Complex arguments.... In N. Milner and P.C. Woodman (eds.), 69-80. Oxford: Oxbow.

2006 Technology. In C.J. Conneller and G. Warren (eds.), 13-34. Stroud: Tempus.

2006a Chipped Stone Tool Industries of the Earlier Neolithic in Eastern Scotland. *SAJ* 28(1): 27-47.

2007 An Archaeology of the Mesolithic in Eastern Scotland: Deconstructing Culture, Constructing Identity. In C. Waddington and K. Pedersen (eds.), 137-150. Oxford: Oxbow.

2009 Times of Change: the Mesolithic and Mesolithic-Neolithic Transition in Northwest Ireland. In P. Crombé, M. van Strydonck, J. Sergant, M. Boudin and M. Bats (eds.), 635-651. Newcastle upon Tyne: Cambridge Scholars.

White, L.
1959 *The Evolution of Culture: The development of Civilization to the Fall of Rome*. Available online at 'http://www.questia.com/PM.qst?a=o&d=8509592' (Last viewed 7th October 2009).

Whittaker, J.C.
1994 *Flintknapping: Making & Understanding Stone Tools*, Austin: University of Texas Press

Whittington, G. and K.J. Edwards
2003 [1997] Climate Change. In K.J. Edwards and I.B.M. Ralston (eds.), 11-22. Edinburgh: Edinburgh University Press.

Whittle, A. and V. Cummings (eds.)
2007 *Going Over: The Mesolithic-Neolithic Transition in North-West Europe*. Oxford: British Academy.

Wicks, K. and Mithen, S.J.
2011 *Billy's Garden: the earliest Mesolithic site in western Scotland.* Archaeology Scotland 11: 8-9.

Wickham-Jones, C.R. (ed.)
1990 *Rhum, Mesolithic and Later Sites at Kinloch: excavations 1984-86.* Edinburgh: Society of Antiquaries of Scotland.

Wickham-Jones, C.R.
1986 The procurement and use of stone for flaked tools in prehistoric Scotland. *PSAS* 116: 7-21.

2004 Structural Evidence in the Scottish Mesolithic. In A. Saville (ed.), 229-242. Edinburgh: Society of Antiquaries of Scotland.

2004a Glossary and notes to the lithic catalogue. In C.R. Wickham-Jones and K. Hardy, 69-71. *SAIR* 12.

2005 Summer Walkers? – Mobility and the Mesolithic. In N. Milner and P. Woodman (eds.), 30-41. Oxford: Oxbow.

2009 The Rising Tide: an examination of Holocene relative sea-level changes and the impact on the prehistoric human population of Orkney. University of Aberdeen (http://www.abdn.ac.uk/staffpages/uploads/arc007/Rising%20Tide%20Project%20Information%20June%2009.pdf). Last viewed 9th June 2011.

Wickham-Jones, C.R. and G.H. Collins
1977 The sources of flint and chert in northern Britain. *PSAS* 109: 7-21.

Wickham-Jones, C.R. and M. Dalland
1998 A small Mesolithic site at Craighead Golf Course, Fife Ness, Fife. *Tayside and Fife Archaeological Journal* 4: 1-19.

Wickham-Jones, C.R. and K. Hardy
2004 Camais Daraich: a Mesolithic site at the Point of Sleat, Skye. *SAIR* 12 (http://www.sair.org.uk/sair12/). Last viewed 6th July 2011.

Wickham-Jones, C.R. and S.B. McCartan
1990 The Lithic Assemblage: Secondary Technology. In C. R. Wickham-Jones (ed.), *Rhum: Mesolithic and Later sites At Kinloch: excavations 1984-86*, 87-102. Edinburgh: Society of Antiquaries of Scotland.

Wickham-Jones, C.R. and P.C. Woodman
1998 Studies on the early settlement of Scotland and Ireland. *Quaternary International* 49/50: 13-22.

Wilk, R.
2004 Miss Universe, the Olmec and the Valley of Oaxaca. *Journal of Social Archaeology* 4(1): 81-98.

Williams, J.
2003 *Gilles Deleuze's Difference and Repetition: a Critical Introduction and Guide*. Edinburgh: Edinburgh University Press.

Williams Thorpe, O. and R.S. Thorpe
1984 The distribution and sources of archaeological pitchstone in Britain. *Journal of Archaeological Science* 11: 1-34.

Wilson, G.
1876 Notes of a collection of Stone Implements and Other Antiquities from Glenluce, Wigtonshire, now presented to the Museum. *PSAS* 11: 580-587.

1878 Notes on the Ancient Stone Implements of Wigtonshire. In D. Douglas (ed.), *Archaeological and Historical Collections relating to the Counties of Ayr and Wigton Volume I*, 1-30. Edinburgh: Ayr and Wigton Archaeological Association.

1881 Notes on a collection of Implements and Ornaments of Stone, Bronze etc from Glenluce, Wigtownshire. *PSAS* 15: 262-276.

Wilson, P.J.
1988 *The domestication of the human species*. New Haven: Yale University Press.

Woodman, P.C.
1977 Recent excavations at Newferry, Co. Antrim. *Proceedings of the Prehistoric Society* 43: 155-199.

1981 The Myth of the Ulster-Scots Connection. Paper delivered to the Scottish Archaeological Forum on 7 March 1981. Note in A. Morrison 'Scottish Archaeological Forum 1981'. *Mesolithic Miscellany* 2(1): 12-13.

1985 *Excavations at Mount Sandel, 1973-77: County Londonderry*. Belfast: HMSO.

1989 A review of the Scottish Mesolithic: a plea for normality. *PSAS* 119: 1-32.

1992 Excavations at Mad Mans Window, Glenarm, Co. Antrim: problems of flint exploitation in East Antrim. *Proceedings of the Prehistoric Society* 58: 77-106.

2009 Ireland's place in the European Mesolithic: why it's ok to be different. In S.B. McCartan, R. Schulting, G. Warren and P.C. Woodman (eds), xxxvi-xlvi. Oxford: Oxbow.

Woodman, P.C., N. Finlay and E. Anderson
2006 *The Archaeology of a Collection: The Keiller-Knowles Collection of the National Museum of Ireland*. Wicklow: Wordwell.

Woodman, P.E.
1997 Archaeological Predictive Modelling using GIS: a Case Study from the Scottish Mesolithic. Unpublished PhD thesis. University of Reading.

Wright, A.D.
2007 The Shelly Knoll: A macroscopic appraisal of the lithic assemblage from Cnoc Sligeach. University of Glasgow: Unpublished undergraduate dissertation.

2008 A macroscopic appraisal of the lithic assemblage from the Late Mesolithic upland scatter site at Climpy, near Forth, South Lanarkshire. University of Glasgow: Unpublished MLitt Dissertation.

Wright, K.I.
2000 The social origins of cooking and dining in early villages of western Asia. *Proceedings of the Prehistoric Society* 66: 89-121.

Wylie, A.
1993 Invented lands, discovered pasts: The westward expansion of myth and history. *Historical Archaeology* 27: 1-19.

Young, R. (ed.)
2000 *Mesolithic Lifeways: Current Research from Britain and Ireland*. Leicester: University of Leicester.

Young, R.
2000a Waiting for the Great Leap Forwards: Some Current trends in Mesolithic Research. In R. Young (ed.), 1-12. Leicester: University of Leicester.

Zetterlund, P.
1990 The Lithic Assemblage: Primary Technology. In C.R. Wickham-Jones (ed.), 64-86. Edinburgh: Society of Antiquaries of Scotland.

Zourabichvili, F.
2004 Deleuze. Une philosophie de l'événement. In F. Zourabichvili, A. Sauvargnargues and P. Marrati (eds.) *La philosophe de Deleuze*, 1-116. Paris: PUF.

Zvelebil, M.
2003 Enculturation of Mesolithic Landscapes. In L. Larsson, H. Kindgren, K.

Knutsson, D. Loeffler and A. Åkerlund (eds.), 65-73. Oxford: Oxbow.

2008 Innovating Hunter-Gatherers: The Mesolithic in the Baltic. In G. Bailey and P. Spikins (eds.), 18-59. Cambridge: Cambridge University Press.

Zvelebil, M. and K. Fewster (eds.)
2001 Ethnoarchaeology and Hunter Gatherers: pictures at an exhibition. Oxford: BAR.